

## CLASS 405, HYDRAULIC AND EARTH ENGINEERING

### SECTION I - CLASS DEFINITION

This class provides for subject matter relating to the following when not provided for elsewhere:

The control or treatment of water in open channels, naturally or artificially occurring bodies of water, or of water otherwise lying on the earth's surface.

The control or treatment of earth material *in situ*, and the securing or stabilization of structures in the earth.

Storage of fluid in underground cavities and disposal of waste in the earth.

Tunnel construction or pipe or cable laying or retrieving.

Apparatus and methods by which underwater work operations may be performed.

Apparatus and methods for launching a marine vessel into or removing it from a body of water, transportation of a vessel across dry land, or exposing a normally wetted surface, e.g., a vessel's hull, to the atmosphere.

### SECTION II - REFERENCES TO OTHER CLASSES

#### SEE OR SEARCH CLASS:

- 14, Bridges, subclasses 75 and 77.3 for piers including structure peculiar to bridge construction. Class 405 provides for piers or piles of general application and methods and apparatus for installing or constructing the same *in situ*.
- 29, Metal Working, for processes and apparatus for mechanical manufacture, repair or disassembly. As between Class 405 and Class 29, an assembling, disassembling, or repair method or apparatus, when restricted to a marine environment or claimed in combination with an earth treating or handling step or means, is proper for Class 405 unless provided for elsewhere. For example, assembly or tunnel lining panels, *per se*, will be found in Class 29, and Class 405 provides for an additional excavating step or means or a step or means for applying the panels to the earth. The assembly or disassembly of pipe or cable is provided for in Class 405 when a step or means is recited for han-

dling earth material, or for submerging or handling the pipe or cable beneath the surface of a body of water.

- 37, Excavating, appropriate subclasses for digging, removing, and handling of excavated material, *per se*, including hydraulic dredging. Class 405 provides for specialized excavating combined with an additional nonexcavating step or means (e.g., tunneling, pipe, and cable laying, etc.).
- 52, Static Structures (e.g., Buildings), appropriate subclasses foundations having additional means which render the foundation peculiar to the support of a particular Class 52 structure (e.g., wall, shaft, etc.), and subclass 155 for piercing or expanding earth anchors. Class 405 takes methods of securing earth anchors or bolts in the earth when the character of the surrounding earth is altered. Class 405 also provides for a Class 52 structure recited in a marine environment (i.e., secured to a marine bed).
- 114, Ships, appropriate subclasses for floating or submerged storage vessels, floating harbors, landing areas, boat docks, etc., which are moored or anchored to the earth by a flaccid connecting member, and subclasses 312+ for submarine vessels without specific means for performing an underwater work operation, other than equipment necessary to effect docking with another active vessel.
- 137, Fluid Handling, subclass 236.1 for fluid handling systems including or particularly related to some geos:graphic feature (e.g., hill, river, ocean, etc.); and subclasses 544+ for means for separating material from a fluid mixture in a tank.
- 138, Pipes and Tubular Conduits, subclasses 97+ for a process or apparatus for repairing conduits. This class (405) provides for methods and apparatus for raising a line of pipe or cable from the floor (subclass 173) and apparatus and methods by which personnel may gain access to a submerged pipeline to repair the same.
- 166, Wells, for processes and apparatus relating to shafts or deep boring in the earth for the extraction of fluids therefrom. Class 405 is generic with respect to Class 166 regarding earth treatment and handling, i.e., Class 166 takes earth treating and handling methods and apparatus peculiar to wells and the formation thereof. Offshore drilling platforms and apparatus for repairing or assembling submerged pipeline to

- a submerged well are classified in Class 405 unless significant well structure is recited.
- 175, Boring or Penetrating the Earth, appropriate subclasses for processes and apparatus for forming a bore in the earth for the reception of a structure. See the class definition of Class 175, Lines With Other Classes and Within This Class, for the line between Class 405 and Class 175.
- 210, Liquid Purification or Separation, appropriate subclasses for means for separating water and foreign matter, particularly subclasses 154+ for flume screens. Class 405 provides for apparatus and methods for containing the spread of a floatable material in a canal or body of water, and for structures which effect the setting of suspended matter in a canal or body of water by retarding the flow and allowing the material to settle by gravity.
- 239, Fluid Sprinkling, Spraying, and Diffusing, appropriate subclasses for terminal elements, per se, which discharge or project a fluid, and see the search note to Class 405 in the Class 239 main definition in References to Other Classes regarding irrigation systems and devices.
- 249, Static Molds, appropriate subclasses for molds for forming hydraulic and earth control structures in situ and which are not combined with earthworking or treating means, and which do not become a permanent part of the structure.
- 264, Plastic and Nonmetallic Article Shaping or Treating: Processes, appropriate subclasses for a method of casting a hydraulic or earth-control structure, per se, without an earthworking or treating step.
- 299, Mining or In Situ Disintegration of Hard Material, appropriate subclasses for a process or apparatus for recovering valuable material from the earth or disintegrating hard material in situ. See References to Other Classes in the class definition of Class 299 for the line.
- 404, Road Structure, Process, or Apparatus, appropriate subclasses for methods and apparatus for treating or otherwise working with the earth when limited to the making, installing, repairing, or maintaining of a highway, pathway, or walkway structure.
- 425, Plastic Article or Earthenware Shaping or Treating: Apparatus, appropriate subclasses for apparatus which include a molding surface which shapes a fluent or bulk material, particularly subclass 59 wherein a portion of the earth below the surface is employed as part of the molding surface. Class 405 provides for the combination of molding and earthworking or treating means.
- 507, Earth Boring, Well Treating, and Oil Field Chemistry, subclasses 100+ for earth boring and well treating compositions.
- 520, Synthetic Resins or Natural Rubbers, appropriate subclasses, particularly Class 523, subclasses 132+ for a composition containing a synthetic resin or natural rubber and having utility in situ as a soil conditioner or stabilizer or to processes of preparing said composition.
- 588, Hazardous or Toxic Waste Destruction or Containment, subclasses 249+ for earth burial of hazardous or toxic waste.

## SUBCLASSES

**1 MARINE VESSEL PORTAGE, LAUNCHING, OR REMOVING:**

This subclass is indented under the class definition. Method or apparatus (a) for introducing a vessel into or removing it from a body of water or for transporting the vessel across a body of land by means resting on or built into the earth, (b) for constructing an artificial vessel basin which is capable of having all the water removed therefrom, or (c) for subcombinations peculiar to such basins which are not provided for elsewhere.

## SEE OR SEARCH CLASS:

425, Plastic Article or Earthenware Shaping or Treating: Apparatus, subclass 61 for a vessel launching means or dry dock combined with a shaping or treating means of that class (425).

**2 Rail mounted carrier:**

This subclass is indented under subclass 1. Method or apparatus wherein the vessel is transported across land or introduced into or removed from a body of water by a wheeled carriage which is supported by and moves along a trackway.

## SEE OR SEARCH CLASS:

114, Ships, subclass 375 for apparatus in the form of chutes on tracks for launching life craft from a ship.

**3 Lifting:**

This subclass is indented under subclass 1. Method or apparatus wherein the vessel is raised or lowered in a substantially vertical manner.

- (1) Note. For placement in this subclass, the vessel should not be required to undergo any significant horizontal movement during the lifting or lowering operation, accordingly, the inclined plane type of launching structure will not be found herein.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 86, for subject matter relating to the lifting of a vessel in a canal.

SEE OR SEARCH CLASS:

- 212, Traversing Hoists, appropriate subclasses for simple hoisting apparatus having means to raising a boat and shifting it horizontally.

**4 Dry dock:**

This subclass is indented under subclass 1. Method or apparatus (a) for exposing the hull of a vessel to the atmosphere by placing the vessel into an artificial basin formed in or on the earth, which basin is capable of having substantially all the water removed therefrom, (b) for constructing such a basin, or (c) for sub-combinations peculiar thereto.

SEE OR SEARCH CLASS:

- 114, Ships, subclasses 45+ for floating dry docks.

**5 Fabrication:**

This subclass is indented under subclass 4. Method or apparatus for constructing an artificial basin into which the vessel to be removed from the water will be placed.

**6 Gate:**

This subclass is indented under subclass 4. Method or apparatus for sealing the entrance into the basin through which the vessel passes.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 85+, for locks associated with navigable canals.  
87+, for water gates associated with other open topped waterways.

**7 Vessel support (e.g., bilge or keel block):**

This subclass is indented under subclass 4. Method or apparatus wherein means are provided to bear the weight or to prevent tilting of a vessel when the water is withdrawn from the basin.

**8 PRESSURIZED CAISSON:**

This subclass is indented under the class definition. Method or apparatus relating to an open bottomed work chamber which is adapted to be placed below the surface of a body of water or the earth, which, while in place, has a portion which extends above said surface to allow access to the chamber and which is supplied with a compressed gas to elevate the pressure therein to prevent the ingress of flowable material.

- (1) Note. Diving bells are not found herein since they do not have a portion, e.g., a shaft extending above the surface of a body of water within which the bell is immersed, which portion allows workmen access to the interior of the bell.
- (2) Note. The caissons found herein provide a work chamber within which men operate while located below the surface of the earth or water, which chamber is pressurized while the men are therein to prevent the ingress of flowable material, e.g., water, muck, etc.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 193, for diving apparatus which are pressurized to prevent ingress of water through an opening, but with no continuous access to the water surface.  
194, for unpressurized diving apparatus having a continuous surface access.

**9 Having lifting cable:**

This subclass is indented under subclass 8. Method or apparatus wherein a flexible, strand-like member is provided to move material between the submerged or below-ground working chamber and the surface.

**10 Movable relative to mobile support:**

This subclass is indented under subclass 8. Method or apparatus wherein the caisson is mounted on and shiftable relative to an ambulant carrier.

**11 MEANS TO EXPOSE A NORMALLY WETTED SURFACE, E. G., COFFERDAM, ETC.:**

This subclass is indented under the class definition. Method or apparatus wherein means are provided to form a temporary removable enclosure about a portion of a submerged surface so that the water contained within the enclosure means can be evacuated to thereby expose the surface portion to the air.

(1) Note. The type of structures to be found herein are removed once work on the submerged surface is completed. Thus, those caissons or cofferdams which physically become part of and are inseparable from a structure formed within such caissons or cofferdams will not be found in this or the indented subclasses.

(2) Note. While the enclosing means found herein are usually used to expose a portion of a sea, lake, or river bed, those devices which are used to expose portion of a ship's hull or sea wall, so that work can be performed thereon will also be found herein.

SEE OR SEARCH THIS CLASS, SUBCLASS:

222, for foundations for marine structures wherein the enclosures used in casting the foundation become an integral part of the finished structure.

**12 Contoured to wetted surface, e.g., side hung ship caisson:**

This subclass is indented under subclass 11. Method or apparatus wherein the enclosure means is provided with a specially configured

face which coacts with an object having a complementary profile to effect a fluid tight seal therebetween.

**13 Having transport, placement, or dislodgement means:**

This subclass is indented under subclass 11. Method or apparatus wherein means are provided (a) to move the enclosing means from one location to another, or (b) to effect either installation of an already formed enclosing means at the site at which it is to be used or its removal therefrom.

SEE OR SEARCH THIS CLASS, SUBCLASS:

203, for marine structures (i.e., working platform) which are floated to a work site.

**14 Connectable sections:**

This subclass is indented under subclass 11. Method or apparatus wherein the enclosure means is composed of a plurality of segments having means which allow the segments to be readily joined together to form the enclosure.

(1) Note. Sheet piling, per se, and methods of installing sheet piles to form a wall will not be found herein unless there is either specific structure limiting the pile to be used in water or a specific step of forming a cofferdam in an aquatic environment.

SEE OR SEARCH THIS CLASS, SUBCLASS:

274+, for sheet piles either used for form retaining walls or which are of general utility.

**15 BANK, SHORE, OR BED PROTECTION:**

This subclass is indented under the class definition. Method or apparatus pertaining to the preservation of shorelines or other areas subject to the erosive influence of water.

(1) Note. Lining of canals, channels, etc., is considered to be impermeabilization and patents relating to the same will be found in appropriate subclasses under EARTH TREATMENT AND CONTROL.

- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
 73, for apparatus for or methods of creating or deepening a channel by concentrating a natural current.  
 263+, and 270, for subject matter relating to an impermeable lining for a canal, channel, etc.
- 16 Revetment:**  
 This subclass is indented under subclass 15. Method or apparatus wherein erosion of a bank or shore is prevented by an object or material resting on and supported by the bank or shore and which is substantially co-extensive with the area that is subject to erosion.
- (1) Note. Whether a wall-like structure is a revetment or a retaining wall is determined solely by its support relationship to the earth. If the earth is supported by the structure, then the structure is considered to be a retaining wall. In those instances where the structure rests upon and covers the earth which is subject to erosion, it is a revetment.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
 262, and 284+, for retaining walls.
- 17 Revetment laying:**  
 This subclass is indented under subclass 16. Method or apparatus for forming a revetment at the location in which it is to be used or the application of a revetment to the site of its intended usage.
- 18 Continuous concrete or concrete filled bag:**  
 This subclass is indented under subclass 16. Apparatus wherein the object or material is in the form of an uninterrupted layer of cement or asphalt concrete or is in the form of a pliant receptacle which is filled with such material.
- 19 Mattress:**  
 This subclass is indented under subclass 16. Apparatus wherein the revetment includes a pliant member which allows the revetment, when laid, to conform to the surface being protected.
- 20 Hinged concrete sections:**  
 This subclass is indented under subclass 19. Apparatus wherein the mattress is a plurality of cement or asphalt concrete segments which are flexible interconnected.
- 21 Wave to flow dissipation:**  
 This subclass is indented under subclass 15. Method or apparatus wherein the kinetic energy of the water is controlled or selectively released or redirected.
- (1) Note. In order to be classified as an original in this and indented subclasses, patents relating to a vertical wall at the water-land interface (e.g., sea wall) must claim a step or means for wave or flow dissipation. In the absence of wave or flow dissipating structure a patent claiming an earth-retaining sea wall or similar structure will be placed in subclass 262 or subclasses 284+.
- 22 Fluid application:**  
 This subclass is indented under subclass 21. Method or apparatus pertaining to contacting the water with a fluid such as air or oil to perform the dissipating function.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
 61, for subject matter relating to the application of fluids for preventing ice formation.  
 62, for subject matter relating to the control of floating matter other than ice by fluid application.
- SEE OR SEARCH CLASS:  
 441, Buoys, Rafts, and Aquatic Devices, subclass 34 for buoys provided with means for distributing oil on the surface of waves.
- 23 Floatable dissipator submerged at site:**  
 This subclass is indented under subclass 21. Method or apparatus in which a wave or flow dissipating structure is floated to the site at which it is to be used and then sunk to assume its dissipating orientation.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

26+, for wave dissipation structures which are floated to a site and continue to float in their operative position.

203+, for other marine structures which are floated to the site of use and sunk.

**24 Artificial seaweed:**

This subclass is indented under subclass 21. Method or apparatus relating to a structure in the form of a plurality of upstanding elongate members anchored to the bed of an active body of water, which members flex in response to movement of the water.

**25 Bed supported subsurface dissipator:**

This subclass is indented under subclass 21. Method or apparatus wherein wave or flow dissipation is effected by a structure which is mounted or resting on the bed of an active body of water and is completely beneath the surface of the water at all times.

**26 Floating:**

This subclass is indented under subclass 21. Method or apparatus wherein wave or flow dissipation is effected by a member which is wholly supported by its buoyancy.

(1) Note. Structures in this and indented subclasses may be anchored at a location and may even be anchored with rigid pilelike anchors as long as the anchor does not provide structural support for the dissipator.

**27 Openwork:**

This subclass is indented under subclass 26. Method or apparatus wherein the floating dissipator is either perforated or is composed of a plurality of spaced apart structural elements and the water's energy is dissipated by flowing through the floating device.

**28 Flexibly suspended from or pivoted to support:**

This subclass is indented under subclass 21. Method or apparatus wherein wave or flow dissipation is effected by a member which either flexibly depends from or is swingably attached to one or more stationary supports.

(1) Note. Suspended or pivoted structures carried by a floating support will not be found in this subclass.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

26+, for structures suspended from or pivoted to a floating support.

**29 Polypod:**

This subclass is indented under subclass 21. Method or apparatus wherein wave or flow dissipation is effected by a structure which includes three or more legs or feet symmetrically radiating from a common center or body.

SEE OR SEARCH CLASS:

52, Static Structures (e.g., Buildings), subclasses 596+ for stonelike modules for building static structures.

**30 Openwork or concave face:**

This subclass is indented under subclass 21. Method or apparatus relating to a structure which includes (a) a portion which dissipates wave or flow by allowing the water to flow therethrough, or (b) a groove-like depression on its wave or flow dissipation surface.

**31 Associated with solid wall:**

This subclass is indented under subclass 30. Method or apparatus wherein the structure includes an impervious wall in combination with an openwork dissipation structure or a concave face.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

262, and 284+, for an earth-retaining wall located at a land-water interface (e.g., sea wall) and without any specific wave dissipation features.

**32 With fabric:**

This subclass is indented under subclass 30. Method or apparatus wherein the openwork portion of the dissipation structure is in the form of a textilelike structure, formed by the joining or intertwining of discrete intersecting strandlike structures.

- (1) Note. This subclass includes trees and branches (e.g., facines) placed in a body of water to dissipate flow.
- 33 Interfitted or interleaved members:**  
This subclass is indented under subclass 30. Method or apparatus wherein the wave or flow dissipating structure includes (a) a plurality of members each of which has a particular configuration permitting interlocking or nesting in abutting fashion with an adjacent member, or (b) a plurality of staggered strata each of which is composed of a plurality of spaced apart members, the members of one stratum bridging the spaces in a juxtaposed stratum.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
273, for interlocking or interleaved cribbing of general utility.
- 34 Jetty:**  
This subclass is indented under subclass 30. Method or apparatus wherein the wave or flow is dissipated by a permeable structure extending outwardly from the shore into the body of water.
- 35 Spaced members:**  
This subclass is indented under subclass 30. Method and apparatus wherein a plurality of elements are joined together in spaced array to form a unitary flow dissipating structure.
- 36 DRAINAGE OR IRRIGATION:**  
This subclass is indented under the class definition. Method or apparatus including a step or means for either (a) collecting and removing surplus water from the soil, (b) applying water to the soil for agricultural purposes, or (c) the installation of apparatus for collecting and removing water from the soil or applying water to the soil.
- (1) Note. For original placement in this and indented subclasses, a claim to a channel or ditch must include structure specific to irrigation or drainage, e.g., a drainage inlet or irrigation outlet.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
118, for open channels with no irrigation outlet or drainage inlet.  
119+, for open channels, above-ground fluid carriers (flumes) with no irrigation features (apertures, etc.).
- SEE OR SEARCH CLASS:  
47, Plant Husbandry, subclass 1.01 for installed irrigation systems having means to supply fertilizer to the irrigating water.  
166, Wells, appropriate subclasses for methods and apparatus relating to wells for recovering fluids from the earth.  
239, Fluid Sprinkling, Spraying, and Diffusing, appropriate subclasses for pressurized irrigating systems with above-ground terminal outlets (e.g., nozzles).  
404, Road Structure, Process, or Apparatus, subclasses 2+ for a drain or gutter combined with walkway or road structure.
- 37 Control means responsive to sensed condition:**  
This subclass is indented under subclass 36. Method or apparatus wherein the drainage or irrigation takes place (a) in response to a sensed characteristic, e.g., soil moisture content, or (b) under the control of a timer.
- SEE OR SEARCH CLASS:  
137, Fluid Handling, subclasses 78+ for miscellaneous fluid handling systems in which fluid flow is controlled in response to a change in an atmospheric condition.  
239, Fluid Sprinkling, Spraying, and Diffusing, subclass 63 for fluid sprinkling systems responsive to ground moisture content and including an above-ground terminal outlet.
- 38 Including subsurface moisture barrier:**  
This subclass is indented under subclass 36. Method or apparatus wherein an artificial layer of water impermeable material is provided below the soil surface and is positioned to pre-

vent the passage of water from a region above the layer to a region therebelow.

- 39 Having regulation to flow through channel:**  
This subclass is indented under subclass 36. Method or apparatus wherein means are provided to cause or control fluid flow within a flow confining passage.

- (1) Note. For placement herein, a patent must recite a flow controller used as part of an irrigation or drainage system. Merely reciting a valve culvert associated with a levee or a water gate in a channel even though the disclosed utility is for irrigation or drainage is not sufficient for placement in this or indented subclasses.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 87+, for water gates and adjustable weirs associated with open channels.  
108, for valved spillways or culverts associated with dams, dikes, levees, etc.

- 40 At outlet or intake:**  
This subclass is indented under subclass 39. Method or apparatus wherein the control takes place at each point (a) of egress of water from a channel to the soil, or (b) of ingress of water from the soil to the channel.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 87+, for water gates associated with open channels which do not have means to specialize them for irrigation.  
108, for flow controllers in spillways for dams or levels.

- 41 Riser or standpipe outlet or intake:**  
This subclass is indented under subclass 40. Method or apparatus wherein the point of egress or ingress is in a pipe which projects upwardly, usually perpendicularly from a main pipe.

- 42 End cap:**  
This subclass is indented under subclass 36. Method or apparatus wherein a tubular member is provided for applying water to or removing it from the soil, which member has means associ-

ated with it to cover or to surround the terminal end of the member.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 48, for apertured pipes having shielded outlets.

- 43 Porous or apertured pipe, flume, or tileway:**  
This subclass is indented under subclass 36. Method or apparatus wherein drainage or irrigation is effected by a structure having a water-conducting channel or passage formed therein and wherein the water is removed from or applied to the soil through (a) a port formed in the side wall of the channel or passage, (b) a foraminous side wall portion of the structure, or (c) the connection or joint between elements used to make up the water conducting structure.

- (1) Note. A manifold which feeds a plurality of feed pipes which in turn supply water to or drain it from the soil will not be found herein unless the feed pipes themselves are apertured or formed of a foraminous material.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 154.1, for subject matter relating to the positioning of a conduit belowground.

SEE OR SEARCH CLASS:

- 47, Plant Husbandry, subclass 48.5 for a container or cartridge which contains water or the like and is adapted to be placed in the ground, whereby the liquid is applied or allowed to diffuse into the soil through some special feature, such as perforations in the container.  
138, Pipes and Tubular Conduits, appropriate subclasses for pipes or tubes of general application.

- 44 Uniform discharge:**  
This subclass is indented under subclass 43. Method or apparatus wherein the water-conducting member includes a feature which ensures that equal amounts of water will be applied to the soil throughout the length of the member.



- (1) Note. A common example of this feature is the variation in aperture size along the length of the member, with small apertures in high pressure areas and larger apertures in the low pressure areas.
- 45 Porous:**  
This subclass is indented under subclass 43. Method or apparatus wherein the sidewall, a portion of the sidewall, or an aperture formed therein includes a foraminous material.
- 46 Earthen bottom:**  
This subclass is indented under subclass 43. Method or apparatus wherein the water-conducting member is in the form of an inverted open channel.
- 47 Flow through joint:**  
This subclass is indented under subclass 43. Method or apparatus wherein the water-conducting member is comprised of serially arranged segments, and the water is removed from or applied to the solid through a space between adjacent ends of said segments.
- 48 Open seam or shielded outlet:**  
This subclass is indented under subclass 43. Method or apparatus wherein (a) the water-conducting member is a generally closed channel which has longitudinally extending juncture formed therein in which an exit or entrance passage is provided, or (b) the exit or entrance passage is provided with means overhanging the passage to preclude the entry of dirt, soil, or like clogging material.
- 49 Corrugated:**  
This subclass is indented under subclass 43. Method and apparatus wherein the water-conducting member includes a series of alternate ridges and grooves extending about the entire periphery.
- (1) Note. The ridges and grooves must be both inside and outside of the conducting member for placement in this subclass.
- 50 Porous waterway, e.g., sand drain, etc.:**  
This subclass is indented under subclass 36. Method or apparatus wherein a highly water permeable material is placed in a less permeable earthen formation to allow water to be conducted within or through the formation.
- 51 Branched flow:**  
This subclass is indented under subclass 36. Method or apparatus wherein a flow draining or distributing system includes a plurality of streams which diverge from or converge on a manifold.
- (1) Note. The term manifold as used herein includes devices such as a pipe or flume having multiple passageways formed in its side wall, or a wall or tube sheet communicating a plurality of pipes with a body of water, etc.
- 52 FLUID CONTROL, TREATMENT, OR CONTAINMENT:**  
This subclass is indented under the class definition. Method or apparatus relating to (a) storing a fluid in an earth formation, (b) creating, regulating, or redirecting the flow of a moving body of liquid, (c) extracting energy from a moving body of liquid, (d) inhibiting the formation of an undesirable suspended material in a body of water, (e) redistributing suspended material in a body of water, or (f) containing the spread of an undesirable floatable material on a body of water.
- (1) Note. Excluded from this subclass are liquid purification or separation process or apparatus.
- SEE OR SEARCH CLASS:**
- 137, Fluid Handling, appropriate subclasses for devices for controlling water under pressure, particularly subclass 236.1 for distribution systems involving geographic features; and subclasses 247+ for liquid seal traps.
- 210, Liquid Purification or Separation, appropriate subclasses for the separation from a liquid of any character of material, and for miscellaneous processes and apparatus for treatment of a liquid mixture for purification not specifically provided for in this class (405).
- 261, Gas and Liquid Contact Apparatus, appropriate subclasses for apparatus specifically adapted to produce an

intimate contact between gases and liquids to exchange properties or mutually modify conditions.

### 53 Fluid storage in earthen cavity:

This subclass is indented under subclass 52. Method or apparatus related to storing a fluid in a reservoir or underground chamber having walls of natural earth or such walls which are coated, lined, or otherwise made less permeable.

- (1) Note. For original placement in this subclass, a patent claiming a fluid storage reservoir must recite the same as a complete container (i.e., including the bottom surface) formed in or on the earth's surface. Patents claiming merely an enclosing wall or levee are excluded and will be found in subclasses 107+.
- (2) Note. The concept of storage includes the ability to retrieve the stored material. Placement of a material in a cavity without retrieval ability is considered to be disposal.
- (3) Note. This subclass is not intended to take mere tanks buried in the earth without any other specific relationship thereto.
- (4) Note. This subclass does not include treatment of the material stored other than that which is incidental to the handling thereof.

SEE OR SEARCH THIS CLASS, SUBCLASS:

107+, for subject matter relating to a fluid-impounding earthen wall without regard to the earth surface underlying the fluid.

129.1, for waste disposal in an earth formation.

SEE OR SEARCH CLASS:

37, Excavating, appropriate subclasses for processes and apparatus relating to digging, handling, and moving material.

48, Gas: Heating and Illuminating, subclasses 174+ for vessels for the storage of gas.

52, Static Structures (e.g., Buildings), appropriate subclasses for building constructions of more general application, particularly subclass 20 for an enclosure with top entrance in cover section; subclasses 128+ for a burial vault; subclasses 169+ for a construction with a particular terranean feature; subclasses 192+ for a liquid or fluent material container with a material port; and subclasses 245+ for an intersecting or curvilinear construction, e.g., storage tanks.

62, Refrigeration, subclasses 45.1+, and particularly subclass 53.1 for methods and apparatus for the handling of liquefied gas involving steps or means special to liquefied gas and more than required for any liquid or gas under pressure.

137, Fluid Handling, appropriate subclasses for methods and structure relating to the handling of fluids, especially subclasses 255+ for plural tanks with parallel flow; subclasses 343+ for fluid handling combined with static constructional installations; subclasses 386+ for liquid level responsive or maintaining systems; and subclasses 561+ for distribution systems.

166, Wells, appropriate subclasses for devices or processes relating to wells which extract fluids from their naturally occurring locations in the earth, see particularly subclass 305.1, for a process utilized in removal of a fluid from its naturally occurring location in the earth which includes the step of causing another fluid to enter the pores of the earth.

175, Boring or Penetrating the Earth, appropriate subclasses for processes and means for forming bores in the earth, particularly subclasses 65+ for processes of boring with fluid; subclasses 207+ for above-ground means for handling drilling fluid or cuttings; and subclass 424 and the search there noted for earth boring nozzles.

425, Plastic Article or Earthenware Shaping or Treating: Apparatus, subclass 59 for apparatus for forming a construction in situ employing a portion

of the earth below-ground level as a mold.

- 54 With indicator or alarm means:**  
This subclass is indented under subclass 53. Method or apparatus wherein means are included for sensing a characteristic of the fluid or a change therein and for providing a signal capable of being perceived by the senses.

- 55 Cavity construction:**  
This subclass is indented under subclass 53. Method or apparatus for the formation of an underground storage chamber or reservoir, or for features of the chamber walls or the surrounding earth.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

132+, for subject matter relating to shaft or tunnel construction.

SEE OR SEARCH CLASS:

299, Mining or In Situ Disintegration of Hard Material, appropriate subclasses for subject matter relating to recovery of valuable material in situ, and particularly subclass 2 for tunnel recovery of fluid material; and subclasses 3+ for in situ conversion of solid to fluid.

- 56 Including cooling or heating of material surrounding cavity:**  
This subclass is indented under subclass 55. Method or apparatus including altering the temperature of the earth or water surrounding the cavity.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

130+, for temperature modification of earthen formations not associated with fluid storage.

SEE OR SEARCH CLASS:

165, Heat Exchange, subclass 45 for a heat exchanger with a geos:graphical feature.

- 57 Earth treatment:**  
This subclass is indented under subclass 55. Method or apparatus wherein the reservoir or storage chamber is formed or has its walls or

boundaries conditioned by application of a chemical composition to the earth.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

263+, for earth treatment by chemicals which is not related to fluid storage.

270, for application of a structure to an earthen formation to render the same impermeable.

- 58 Dissolving earth:**  
This subclass is indented under subclass 57. Method or apparatus wherein the reservoir or storage chamber is formed by disintegrating earthen material, usually by contacting the material with a solvent.

- 59 Supply or recovery of stored fluid by separate fluid:**

This subclass is indented under subclass 53. Method or apparatus wherein the storage fluid is discharged from or admitted to the reservoir or storage chamber by the addition or removal of a second fluid.

SEE OR SEARCH CLASS:

222, Dispensing, subclasses 394+ for dispensing apparatus employing a pressure fluid to dispense another fluid from a supply.

- 60 Floatable matter containment:**  
This subclass is indented under subclass 52. Method or apparatus wherein the formation of an undesired buoyant material is inhibited or an already formed undesired buoyant material is confined or regulated to include the confinement or regulation of a hazardous or toxic waste.

SEE OR SEARCH CLASS:

210, Liquid Purification or Separation, appropriate subclasses for residual subject matter relating to the separation from a liquid of any character of material.

588, Hazardous or Toxic Waste Destruction or Containment, subclasses 249+

**60.5 Logging device for guiding floating logs:**

This subclass is indented under subclass 60. Device connected to a waterway bank and extending in the waterway, which directs logs or similar material around bends in the waterway or into holding areas.

**61 Ice:**

This subclass is indented under subclass 60. Method or apparatus wherein the substance being confined, regulated, or whose formation is inhibited is ice.

- (1) Note. Devices, such as fenders, guides, comminutors, etc., associated with marine structures to prevent ice formation on the structure or damage to such structures will not be found herein since such structures neither prevent the formation of floating ice nor do they confine a mass of floating ice.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 211+, for subject matter relating to the control of ice formation on marine structure.

**62 Barrier formed by fluid:**

This subclass is indented under subclass 60. Method or apparatus wherein a gaseous or liquid medium confines the floatable matter.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 22, for wave or flow dissipation by fluid application.

**63 Floating barrier:**

This subclass is indented under subclass 60. Method or apparatus wherein a buoyant structure with portions both above and below the water surface is provided to control the floatable matter.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 26+, for floating wave dissipators.

SEE OR SEARCH CLASS:

- 210, Liquid Purification or Separation, subclasses 242.1+ for buoyant devices for separating oil from a body of water.

**64 Submergible:**

This subclass is indented under subclass 63. Method or apparatus wherein the barrier can be shifted from a floating orientation to a position completely beneath the water surface.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 23, for wave dissipators.  
171, for subject matter relating to submerging a line of pipe or cable by controlling the buoyancy of the same.  
205+, for marine structures which are floated to a site and sunk into an operative position.

**65 With means to seal space between barrier and fixed structure:**

This subclass is indented under subclass 63. Method or apparatus wherein provision is made to prevent passage of floatable matter between the end of the buoyant structure and an adjacent relatively stationary structure, e.g., dock.

**66 With barrier storage or deployment feature:**

This subclass is indented under subclass 63. Method or apparatus wherein the buoyant structure includes a feature which facilitates its shifting from an operative floating matter control orientation to a more compact, nonuse orientation or vice versa.

**67 Quick release float:**

This subclass is indented under subclass 66. Method or apparatus wherein the buoyant structure includes a floatation member which is readily separable from or attachable to a curtainlike barrier to facilitate storage or deployment.

**68 Inflatable or deflatable:**

This subclass is indented under subclass 66. Method or apparatus wherein the barrier includes a float portion which is expanded when being deployed by a buoyancy producing medium, or is expandable to receive such a

- medium or when being stored is collapsed by the removal of the buoyancy producing medium contained therein.
- 69 Self-inflating:**  
This subclass is indented under subclass 68. Method or apparatus wherein the medium which effects the inflation of the float portion of the buoyant structure is carried by the buoyant structure.
- 70 Having joint detail:**  
This subclass is indented under subclass 63. Method or apparatus wherein means are provided for connecting adjacent ends of a plurality of barrier sections.
- 71 Having hinged joint between rigid sections:**  
This subclass is indented under subclass 70. Method or apparatus wherein the connection allows movement in one or more planes between adjacent inflexible sections when the barrier is in its deployed condition.
- 72 With reinforcing feature:**  
This subclass is indented under subclass 63. Method or apparatus wherein the buoyant structure is provided with a load carrying feature which bears the forces applied to the structure.
- 73 Erosive scouring:**  
This subclass is indented under subclass 52. Method or apparatus relating to the removal of a sediment deposit by the concentration of a natural current.
- 74 Settling of suspended matter in a specific location (e.g., at a scoured pier):**  
This subclass is indented under subclass 52. Fluid control for effecting precipitation by gravity of a nonbuoyant material suspended in a body of water at a site in need of this material to, e.g., protect underwater devices such as pipes or cables, redirect flow, or fill in undesirable trenches as a result of scouring.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
15+, for bank, shore, or bed protecting structures, such as jetties, groins, and breakwaters, especially subclasses 21+ for wave or flow dissipating structures which may cause the settling of suspended matter as a result of their retarding or calming action on the water.
- 60+, for the collection or containment of buoyant material.
- SEE OR SEARCH CLASS:  
37, Excavating, subclasses 307+ for dredgers which excavate material under a mass of liquid.  
210, Liquid Purification or Separation, subclass 170 and 747 of an in situ still or flowing liquid.
- 75 Extracting power from moving fluid:**  
This subclass is indented under subclass 52. Method or apparatus for the extraction of energy from a moving body of water.
- (1) Note. Hydraulic power production and claims to the combination of water-channels with motors will be found in Classes 60, Power Plants; 91, Motors: Expandable Chamber Type; 290, Prime-Mover Dynamo Plants; and 415, Rotary Kinetic Fluid Motors or Pumps.
- SEE OR SEARCH CLASS:  
290, Prime-Mover Dynamo Plants, subclass 43 and 54 for the combination of electric power producing means and a fluid current motor to drive the same.  
416, Fluid Reaction Surfaces (i.e., Impellers), appropriate subclasses for unhoused water wheels or turbines, especially subclass 197 for Pelton wheels.
- 76 Wave or tide:**  
This subclass is indented under subclass 75. Method or apparatus for the utilization of the energy present in the surface undulations or the tidal variations in the surface level of a natural water body.
- SEE OR SEARCH CLASS:  
60, Power Plants, subclass 497 for wave or tide motors having a buoyant working member.  
290, Prime-Mover Dynamo Plants, subclass 42 and 53 for the combination of electric power producing means and a tide or wave motor to drive the same.

- 77 With flow restrictor or ramp:**  
This subclass is indented under subclass 76. Method or apparatus which accelerates the flow by causing it to pass through a narrowed opening or elevates the water by causing it to flow up an inclined plane.
- 78 Associated with dam:**  
This subclass is indented under subclass 75. Method or apparatus wherein the energy is extracted by means which is within or adjacent to an artificial barrier constructed to control the flow or raise the level of the body of water.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
107+, for a dam, per se, without details relating to extracting energy from the water.
- 79 Wave generation or enhancement:**  
This subclass is indented under subclass 52. Method or apparatus concerning the production or intensification of swells in water.
- SEE OR SEARCH CLASS:  
4, Baths, Closets, Sinks, and Spittoons, subclass 491 for swimming pools with wave generating apparatus.  
472, Amusement Devices, subclass 128 for portable wave generators.
- 80 Flow control:**  
This subclass is indented under subclass 52. Method or apparatus for conducting a fluid through a predetermined path or for regulating or modifying the fluid's movement through such a path.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
15+, for subject matter concerned with controlling or altering a natural current to preserve a bank, shore, or bed.
- 81 Fishway:**  
This subclass is indented under subclass 80. Method or apparatus to enable fish to pass an obstruction in a stream.
- 82 Elevator:**  
This subclass is indented under subclass 81. Method or apparatus wherein the fish are mechanically raised or lowered to carry them around the obstruction.
- 83 Closed channel:**  
This subclass is indented under subclass 81. Method or apparatus wherein the fishway is in the form of a pipe or other enclosed waterway.
- 84 Navigable canal:**  
This subclass is indented under subclass 80. Method or apparatus relating to navigable waterways or miscellaneous appliances not otherwise classifiable for use therein.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
268, for the mere lining of a canal bed with a cementitious material.
- 85 Having lock:**  
This subclass is indented under subclass 84. Method or apparatus for shifting a vessel from one level to another in a canal.
- 86 Movable lifting member:**  
This subclass is indented under subclass 85. Method or apparatus relating to a device for shifting a vessel from one level to another in a canal wherein some portion of the device moves with and lifts the vessel.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
3, for subject matter relating to the lifting of a vessel for the purpose of dewatering the same.
- 87 Water gate or adjustable weir:**  
This subclass is indented under subclass 80. Method or apparatus relating to movable regulators which control the volume of water flowing through an open channel.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
107, for an artificial barrier (e.g., dam, levee, etc.) constructed to obstruct the flow of a natural body of water.

- SEE OR SEARCH CLASS:  
 73, Measuring and Testing, subclass 215 for weirs and water gates in combination and metering means.  
 251, Valves and Valve Actuation, appropriate subclasses for gates employed other than in a Class 405 environment.
- 88 Center flow:**  
 This subclass is indented under subclass 87. Method or apparatus wherein a hollow flow regulating member is movably mounted on a submerged takeoff whereby liquid flows in a controllable fashion across the perimeter of and through the hollow member into the takeoff.
- 89 Uniform discharge:**  
 This subclass is indented under subclass 87. Method or apparatus wherein the water gate passes only a specific or predetermined volume of liquid.
- 90 Removable:**  
 This subclass is indented under subclass 87. Method or apparatus relating to a water gate which opens and closes by removing and replacing the entire gate structure.
- 91 Flexible:**  
 This subclass is indented under subclass 90. Method or apparatus wherein the removable gate is composed of a pliant material.
- 92 Condition responsive:**  
 This subclass is indented under subclass 87. Method or apparatus wherein a characteristic or a change in a characteristic is effective to change the position of the water gate.
- 93 To weight of liquid separated from a main body:**  
 This subclass is indented under subclass 92. Method or apparatus wherein the water gate has associated therewith which receives liquid therein from the body of liquid controlled by the water gate which means responds to the weight of the received liquid to control the position of the gate.
- 94 To pressure on pivoted water gate:**  
 This subclass is indented under subclass 92. Method or apparatus wherein a variation in the head of an accumulated body of liquid acting against a swinging water gate is effective to open or close the gate.
- 95 With latch for closed position:**  
 This subclass is indented under subclass 94. Method or apparatus including a restraining means to retain the water gate in its closed position, wherein the water gate is opened by the pressure of the liquid only after the restraining means is released.
- 96 Float:**  
 This subclass is indented under subclass 92. Method or apparatus wherein a buoyant member is employed to sense the height of an accumulated liquid.
- 97 Having separate float chamber:**  
 This subclass is indented under subclass 96. Method or apparatus wherein the buoyant member is positioned within a container which is distinct from but in fluid communication with the flow path.
- 98 Roller or flexible:**  
 This subclass is indented under subclass 87. Method or apparatus wherein the water gate (a) is a cylindrical structure which rotates about its axis to open and close, or (b) is made of sections, flexibly interconnected which opens and closes by being rolled, folded, or bent out of its closed position plane.
- 99 Swinging:**  
 This subclass is indented under subclass 87. Method or apparatus wherein the water gate turns about a pivot.
- 100 About horizontal axis:**  
 This subclass is indented under subclass 99. Method or apparatus wherein the water gate pivots about an axis which is generally parallel to the horizon.
- 101 Overflow:**  
 This subclass is indented under subclass 100. Method or apparatus wherein the liquid flows over the top of the water gate when it is opened.

**102 Collapsible:**

This subclass is indented under subclass 101. Method or apparatus wherein the water gate is provided with a support member extending from the water gate to a point longitudinally spaced therefrom on the bed of the flow path which gate and support contiguously fold downwardly onto the bed when the gate is opened.

**103 Sliding:**

This subclass is indented under subclass 87. Method or apparatus wherein the movable member comprises an element which is movable in a generally rectilinear fashion.

**104 Vertical:**

This subclass is indented under subclass 103. Method or apparatus wherein the movable member is raised or lowered to regulate flow there past.

**105 Gate unseating:**

This subclass is indented under subclass 104. Method or apparatus wherein (a) means are provided for shifting the movable member out of contact with a cooperating sealing surface prior to or at the moment vertical movement begins, or (b) the movable member and the cooperating sealing surface are so configured that as the member is moved vertically from its sealing position, the member moves entirely off the sealing surface.

SEE OR SEARCH CLASS:

251, Valves and Valve Actuation, subclasses 157+ for valves having unseating mechanisms.

**106 With lift mechanism or latch:**

This subclass is indented under subclass 104. Method or apparatus including means (a) to provide a mechanical advantage to raise the gate, or (b) to hold the gate in a predetermined position.

**107 Artificial water barrier (e.g., dam, levee, etc.):**

This subclass is indented under subclass 80. Method or apparatus relating to a fixed artificial construction placed to obstruct the flow of a body of water so as to stop substantially all

flow or to prevent lateral spreading of the body of water.

SEE OR SEARCH THIS CLASS, SUBCLASS:

87, for apparatus for regulating the volume rate of fluid moving in an open channel.

**108 Having spillway:**

This subclass is indented under subclass 107. Method or apparatus relating to channels for allowing surplus water to pass around or through the barrier at some point between its crest and base.

SEE OR SEARCH THIS CLASS, SUBCLASS:

75, for subject matter relating to channels modified or arranged for the utilization of the power of the water flowing therethrough, and particularly subclass 78 for similar channels associated with dams.

88, for water impounding means having adjustable center flow weirs associated therewith.

**109 Having impervious core:**

This subclass is indented under subclass 107. Method or apparatus in which an impermeable center is placed in the barrier to prevent seepage.

SEE OR SEARCH THIS CLASS, SUBCLASS:

263+, and 270, for impermeabilization of an earth formation, not associated with a dam, dike, or levee.

**110 Hollow or buttressed:**

This subclass is indented under subclass 107. Method or apparatus in which the barrier is supported against the thrust of the water by some form of reinforcing structure either within or behind the barrier, or is made up of an empty shell closed front and rear.

**111 With ballast compartment or cavity:**

This subclass is indented under subclass 110. Method or apparatus wherein the barrier includes or has attached thereto a hollow structure into which is placed water, rock, concrete, etc., to stabilize the barrier.



**112 Vertical wall buttress:**

This subclass is indented under subclass 110. Method or apparatus wherein the barrier is provided with a plurality of spaced vertical partitionlike members extending perpendicularly outward on the downstream or backside of the barrier and which are vertically coextensive with the barrier.

**113 Tension stayed:**

This subclass is indented under subclass 107. Method or apparatus wherein the barrier is supported against the thrust of the water by external load carrying members which tend to stretch under the force of the water.

**114 Connectable sections:**

This subclass is indented under subclass 107. Method or apparatus wherein (a) a section of the barrier consists of preformed units assembled for use, or (b) the barrier is formed in sections with a connecting or sealing means between the adjacent sections.

**115 Flexible:**

This subclass is indented under subclass 107. Method or apparatus wherein a portion of the barrier bends in response to forces exerted upon it by the obstructed stream.

**116 In situ construction:**

This subclass is indented under subclass 107. Method or apparatus relating to building a barrier at the site of use.

SEE OR SEARCH THIS CLASS, SUBCLASS:

267, for the construction of an underground cementitious wall for the control or diversion of subterranean water.

**117 Earthen:**

This subclass is indented under subclass 116. Method or apparatus concerning the deposition of soil or rock to form a barrier.

SEE OR SEARCH THIS CLASS, SUBCLASS:

53+, for subject matter relating to fluid storage in earth cavities.

263+, for chemical treatment of earth formations.

270, for impermeabilization of earth formations by other than chemical treatment.

**118 Open channel:**

This subclass is indented under subclass 80. Method or apparatus wherein the flow path is in the form of a trough.

SEE OR SEARCH THIS CLASS, SUBCLASS:

264+, for the treatment or coating of the earthen walls of the channel with an organic compound (e.g., asphalt) to impermeabilize the same.

268, for lining a channel with cementitious materials.

271, for the mere compacting of an earthen formation, e.g., a channel.

**119 Flume:**

This subclass is indented under subclass 118. Method or apparatus wherein the trough is an artificial structure wholly disposed above the surface of the ground.

SEE OR SEARCH CLASS:

52, Static Structures (e.g., Buildings), subclasses 11+ for a building roof with an eave or valley gutter.

**120 Elbow or tee:**

This subclass is indented under subclass 119. Method or apparatus concerned with either (a) providing a flume with a bent section therein, or (b) providing an opening in the wall of a flume section for communication with another intersecting flume section.

**121 Joint:**

This subclass is indented under subclass 119. Method or apparatus relating to the connection or seal between sections of a flume.

SEE OR SEARCH CLASS:

285, Pipe Joints or Couplings, appropriate subclass for joints in closed conduits.

**122 Including U-clamp:**

This subclass is indented under subclass 121. Method or apparatus wherein the flume sections are connected by a mechanical fastening means which is similar in cross section to the flume.

**123 With crossbar:**

This subclass is indented under subclass 122. Method or apparatus wherein the fastening means further comprises an element which bridges the top of the U-clamp.

**124 Culvert:**

This subclass is indented under subclass 80. Method or apparatus relating to conducting water not under pressure within a closed fluid conduit through an embankment.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

184, for a method or apparatus for advancing a length of conduit through an embankment.

SEE OR SEARCH CLASS:

138, Pipes and Tubular Conduits, appropriate subclass for pipe structure, per se.

**125 Terminal or head:**

This subclass is indented under subclass 124. Method or apparatus including specific structure at the culvert inlet or outlet.

**126 Serially connected segments:**

This subclass is indented under subclass 124. Method or apparatus wherein the culvert is comprised of a plurality of preformed sections of similar cross section connected in end-to-end fashion.

SEE OR SEARCH CLASS:

138, Pipes and Tubular Conduits, subclass 155 for similar structure in pipes of general utility.

**127 Intake:**

This subclass is indented under subclass 80. Method or apparatus relating to a structure designed to act as an inlet for a submerged pipe line.

**128.1 SOIL REMEDIATION:**

This subclass is indented under the class definition. Subject matter for the relieving, curing, correcting, counteracting, or otherwise altering of earth having an unwanted pre-existing condition, wherein the earth is treated in situ or

there is a step of removal of the earth from its in situ site.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

129.2, for the treatment of waste prior to the subterranean deposition of the waste.

129.65, for the treatment of the soil prior to the subterranean deposition of waste in the soil.

SEE OR SEARCH CLASS:

134, Cleaning and Liquid Contact With Solids, subclass 25.1 for the remediation of soil with the use of a surfactant.

166, Wells, subclass 268 for a collection well which is used to collect contaminants of ground water as they are urged to the collection well.

210, Liquid Purification or Separation, subclass 601 for a chemical treatment process to treat ground water with the use of microorganisms and subclass 749 for a chemical treatment process wherein a material is added to the liquid and chemically reacts with a constituent in the liquid to perfect the liquid for an intended use or render the liquid less noxious, wherein the liquid may be ground water.

435, Chemistry: Molecular Biology and Microbiology, appropriate subclasses, especially subclass 262.5 for the treatment or remediation of earth with the use of microorganisms.

588, Hazardous or Toxic Waste Destruction or Containment, appropriate subclasses for a process of destroying or containing hazardous or toxic waste, or making the waste environmentally safe, where any products of the process are intended to be safely discarded or whose production is only incidental to the destruction or containment. Waste proper for classification in Class 588 is considered to be too hazardous or toxic for placement in an ordinary municipal landfill.

**128.15 In situ contaminant removal or stabilization:**

This subclass is indented under subclass 128.1. Subject matter wherein the soil contains impu-

urities or pollutants or is in an unstable state and (1) the impurities or pollutants are separated or taken away from the soil or (2) the unstable state of the soil is improved while the soil is in its natural or original in-ground position.

- (1) Note. "In situ" remediation is defined as remediation of the soil as it originally exists in its natural in-ground state, as opposed to the removal of the soil from its original position in the ground for remediation and then replacement of the remediated soil back into the ground.

**128.2 Vacuuming contaminant:**

This subclass is indented under subclass 128.15. Subject matter wherein a suction or pressure differential is used to aid in the removal or withdrawal of the impurities or pollutants from the soil.

SEE OR SEARCH CLASS:

588, Hazardous or Toxic Waste Destruction or Containment, appropriate subclasses for a process of destroying hazardous or toxic waste by vacuuming to drive off or produce a volatile environmentally safe substance.

**128.25 With fluid application:**

This subclass is indented under subclass 128.2. Subject matter wherein a fluid is applied to the soil prior to or during the suction step to aid in (1) the removal of the impurity or pollutant from the soil or (2) the stabilization of the soil.

**128.3 At spaced locations:**

This subclass is indented under subclass 128.25. Subject matter wherein the fluid is applied to the soil in plural distinct areas simultaneously to aid in (1) the removal of the impurity or pollutant from the soil or (2) the stabilization of the soil.

**128.35 With heat:**

This subclass is indented under subclass 128.3. Subject matter wherein the temperature of the soil is elevated to aid in (1) the removal of the impurity or pollutant in the soil or (2) the stabilization of the soil.

SEE OR SEARCH THIS CLASS, SUBCLASS:

130, for the temperature modification of an earth formation not for the purpose of soil remediation.

**128.4 With heat:**

This subclass is indented under subclass 128.2. Subject matter wherein the temperature of the soil is elevated to aid in (1) the removal of the impurity or pollutant in the soil or (2) the stabilization of the soil.

SEE OR SEARCH THIS CLASS, SUBCLASS:

130, for the temperature modification of an earth formation not for the purpose of soil remediation.

**128.45 With treatment:**

This subclass is indented under subclass 128.15. Subject matter wherein a step is performed on or with the soil to aid in (1) the removal of the impurity or pollutant from the soil or (2) the stabilization of the soil.

**128.5 Chemical:**

This subclass is indented under subclass 128.45. Subject matter wherein a substance having specific chemical makeup or detail is applied to the soil to aid in (1) the removal of the impurity or pollutant or (2) the stabilization of the soil.

SEE OR SEARCH THIS CLASS, SUBCLASS:

263, for earth treatment, wherein a chemical substance is applied directly to an earthen formation to either (1) form a coating on the formation, (2) impregnate the formation, or (3) fill a subterranean cavity within the formation, wherein there is no altering of impurities or contaminants in the earthen formation.

**128.55 With heat:**

This subclass is indented under subclass 128.5. Subject matter wherein the temperature of the soil is elevated to aid in (1) the removal of the impurity or pollutant in the soil or (2) the stabilization of the soil.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

130, for the temperature modification of an earth formation not for the purpose of soil remediation.

**128.6 Temperature:**

This subclass is indented under subclass 128.45. Subject matter wherein a degree of cold or heat is utilized on the soil to aid in (1) the removal of the impurity or pollutant or (2) the stabilization of the soil.

**128.65 Vitrify:**

This subclass is indented under subclass 128.6. Subject matter for producing a solid phase, water insoluble, amorphous, glass-like solid to aid in the stabilization of the soil.

SEE OR SEARCH CLASS:

588, Hazardous or Toxic Waste Destruction or Containment, subclass 252 for a process of containing hazardous or toxic waste by the use of vitrification as a means for immobilizing hazardous or toxic waste.

**128.7 With treatment:**

This subclass is indented under subclass 128.1. Subject matter wherein a step is performed on or with the soil to aid in (1) the removal of the impurity or pollutant from the soil or (2) the stabilization of the soil.

**128.75 Chemical:**

This subclass is indented under subclass 128.7. Subject matter wherein a substance having significant chemical makeup or detail is applied to the soil to aid in (1) the removal of the impurity or pollutant or (2) the stabilization of the soil.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

263, for earth treatment, wherein a chemical substance is applied directly to an earthen formation to either (1) form a coating on the formation, (2) impregnate the formation, or (3) fill a subterranean cavity within the formation, wherein there is no altering of impurities or contaminants in the earthen formation.

**128.8 With heat:**

This subclass is indented under subclass 128.75. Subject matter wherein the temperature of the soil is elevated to aid in (1) the removal of the impurity or pollutant in the soil or (2) the stabilization of the soil.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

130, for the temperature modification of an earth formation not for the purpose of soil remediation.

**128.85 Temperature:**

This subclass is indented under subclass 128.7. Subject matter wherein a degree of cold or heat is utilized on the soil to aid in (1) the removal of the impurity or pollutant or (2) the stabilization of the soil.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

130, for the temperature modification of an earthen formation not for the altering of the impurities or pollutants in the earthen formation.

**128.9 Vitrify:**

This subclass is indented under subclass 128.85. Subject matter for producing a solid phase, water insoluble, amorphous, glass-like solid to aid in the stabilization of the soil.

SEE OR SEARCH CLASS:

588, Hazardous or Toxic Waste Destruction or Containment, subclass 252 for a process of containing hazardous or toxic waste by the use of vitrification as a means for immobilizing hazardous or toxic waste.

**129.1 SUBTERRANEAN WASTE DISPOSAL, CONTAINMENT, OR TREATMENT:**

This subclass is indented under the class definition. Subject matter concerning the (1) deposition of waste in an earth formation, (2) confinement of the waste in a structure which exists or is deposited in the earth, or (3) the treatment of the waste or the soil prior to the deposition of waste in the soil.

## SEE OR SEARCH CLASS:

- 166, Wells, subclass 305.1 for a process utilized in the removal of a fluid from its naturally occurring location in the earth which includes the step of causing another fluid to enter the pores of the earth.
- 588, Hazardous or Toxic Waste Destruction or Containment, subclass 249 for a process of containing hazardous or toxic waste in an earth formation.

**129.15 Compacting:**

This subclass is indented under subclass 129.1. Subject matter wherein a load or cyclic force is utilized to cause consolidation of the waste or waste site before or after the waste disposal.

## SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 271, for the application of a load or cyclic force to cause consolidation of an earthen formation.

**129.2 With treatment of waste:**

This subclass is indented under subclass 129.1. Subject matter wherein the waste is treated prior to the subterranean deposition of the waste.

## SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 128.1, for the remediation of soil with existing contaminants or impurities (i.e., post-waste disposal soil treatment).

## SEE OR SEARCH CLASS:

- 588, Hazardous or Toxic Waste Destruction or Containment, appropriate subclasses for a process of destroying hazardous or toxic waste, or making hazardous or toxic waste environmentally safe.

**129.25 Chemical:**

This subclass is indented under subclass 129.2. Subject matter wherein a substance having specific chemical makeup or detail is applied to the waste prior to the subterranean deposition of the waste in the soil.

## SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 128.5, for the in situ application of a chemical to aid in the remediation of the soil having existing contaminants or impurities.
- 128.75, for the ex situ application of a chemical to aid in the remediation of the soil having existing contaminants or impurities wherein there is a step of removal of the soil from its natural in situ state.
- 263, for earth treatment, wherein a chemical substance is applied directly to an earthen formation to either (1) form a coating on the formation, (2) impregnate the formation, or (3) fill a subterranean cavity within the formation.

**129.27 With heat:**

This subclass is indented under subclass 129.25. Subject matter wherein the temperature of the waste is elevated prior to the subterranean deposition of the waste.

**129.28 Temperature:**

This subclass is indented under subclass 129.2. Subject matter wherein the temperature of the waste is altered prior to the subterranean deposition of the waste.

**129.3 Solidification:**

This subclass is indented under subclass 129.2. Subject matter wherein a treatment is performed on the waste to produce a solid phase nonleachable product for subterranean deposition.

**129.35 Earthen formation:**

This subclass is indented under subclass 129.1. Subject matter wherein the waste is deposited or injected into a void or cavity in the earth.

- (1) Note. The void or cavity can be created by the deposition or injection of the waste.

## SEE OR SEARCH CLASS:

- 588, Hazardous or Toxic Waste Destruction or Containment, subclass 249, specifically subclass 250 for a process of containing hazardous or toxic waste in earthen cavities.

**129.4 Hydraulic fracture:**

This subclass is indented under subclass 129.35. Subject matter wherein fluid pressure is utilized for breaking or separating the earth to create an earthen cavity for the subterranean deposition of waste.

- (1) Note. Nonforcible injection into softer soil or earth would not be considered fracturing for this subclass.

**SEE OR SEARCH CLASS:**

166, Wells, subclass 305.1 for a process utilized in the removal of a fluid from its naturally occurring location in the earth which includes the step of causing another fluid to enter the pores of the earth.

**129.45 Waste barrier , containment or monitoring:**

This subclass is indented under subclass 129.1. Subject matter wherein there is provided (1) a material object or treatment of the soil to impede or restrict or monitor the condition or movement of the waste or product or (2) an all-encompassing vessel or structure to completely contain the waste.

**SEE OR SEARCH CLASS:**

588, Hazardous or Toxic Waste Destruction or Containment, subclass 249 for a process of containing hazardous or toxic waste.

**129.5 Monitoring, detecting, or sensing:**

This subclass is indented under subclass 129.45. Subject matter wherein a condition or state of operation or movement of the waste, waste site, waste barrier, or containment structure for waste is observed, determined, or detected.

**SEE OR SEARCH CLASS:**

588, Hazardous or Toxic Waste Destruction or Containment, subclass 260 for a process of containing hazardous or toxic waste wherein the integrity of the containment is observed by chemical, physical, electrical, or optical methods to sense, detect, or monitor movement of the waste.

**129.55 Complete containment structure:**

This subclass is indented under subclass 129.45. Subject matter providing a complete independent vessel or structure for enclosing, surrounding or containing the waste which prevents or inhibits the undesirable association of the waste with surrounding elements in all directions.

**129.57 With drainage or collection:**

This subclass is indented under subclass 129.55. Subject matter providing for (1) the gradual outflow or (2) the gathering of any fluids or waste products that accumulate within the vessel.

**129.6 Floor, pit, or wall:**

This subclass is indented under subclass 129.45. Subject matter providing a waste containing barrier (natural or artificial) which prevents or inhibits the undesirable association of the waste, waste site, or products of the waste with elements below or beside the waste or waste site.

**129.65 With treatment:**

This subclass is indented under subclass 129.6. Subject matter wherein the soil is treated prior to the subterranean deposition of waste into the soil.

**129.7 With drainage or collection:**

This subclass is indented under subclass 129.6. Subject matter providing for (1) the gradual outflow or (2) the gathering of any fluids or waste products that accumulate or come to exist within or near the waste containment area.

**129.75 Flexible sheet or liner:**

This subclass is indented under subclass 129.6. Subject matter wherein the waste containing barrier is a thin, pliable two-dimensional, web member.

**129.8 Rigid sectional members:**

This subclass is indented under subclass 129.6. Subject matter wherein the waste containing barrier includes of plural stiff or unyielding structures.

**129.85 Drainage or collection:**

This subclass is indented under subclass 129.45. Subject matter providing for (1) the gradual outflow or (2) the gathering of any fluids or waste products that accumulate or come to exist within or near the waste containment area.

**129.9 Daily cover:**

This subclass is indented under subclass 129.45. Subject matter wherein a waste barrier is provided above the waste or waste site on a scheduled day-to-day basis to prevent or inhibit the undesirable association of the waste, waste site, or products of the waste with elements, pests, or vermin above the waste or waste site.

**129.95 Landfill:**

This subclass is indented under subclass 129.1. Subject matter wherein a predetermined amount of waste is buried between layers of earth to build up low-lying areas.

**130 TEMPERATURE MODIFICATION OR CONTROL OF EARTHEN FORMATION:**

This subclass is indented under the class definition. Method or apparatus wherein the heat content of an earthen deposit is altered.

SEE OR SEARCH THIS CLASS, SUBCLASS:

56, for temperature modification of the earth surrounding an underground storage cavity.

SEE OR SEARCH CLASS:

165, Heat Exchange, subclass 45 for a heat exchanger with a geos:graphical feature.

175, Boring or Penetrating the Earth, subclass 17 for process or apparatus for boring combined with a step or means to heat or cool within the bore.

299, Mining or In Situ Disintegration of Hard Material, subclasses 3+ for subject matter involving mining and in situ conversion of solid material to fluid, including thawing earth when combined with excavating hard, solid material; and subclass 11 for a mining or in situ disintegration of hard material process including the stabilizing of underground earth structure.

**131 Heating:**

This subclass is indented under subclass 130. Method or apparatus wherein the temperature of an earth formation is elevated.

SEE OR SEARCH CLASS:

175, Boring or Penetrating the Earth, subclasses 11+ for processes or apparatus for boring or penetrating the earth by directly applying heat to fluidize or comminute.

**132 UNDERGROUND PASSAGEWAY, E.G., TUNNEL:**

This subclass is indented under the class definition. Method or apparatus relating to the formation of a subterranean or subaqueous corridor to permit passage of personnel, vehicles, or equipment therethrough.

(1) Note. Patents relating to the subterranean or subaqueous placement of a conduit for conveying fluent material will be found in subclasses 154+.

SEE OR SEARCH THIS CLASS, SUBCLASS:

154.1, for subject matter relating to the placement of pipe or cable beneath the surface of the earth or a body of water.

272+, for subject matter relating to shoring and cave-in prevention.

SEE OR SEARCH CLASS:

175, Boring or Penetrating the Earth, appropriate subclasses for a process or apparatus for forming a bore in the earth.

299, Mining or In Situ Disintegration of Hard Material, appropriate subclass for a process or apparatus for excavating hard, solid material to form a tunnel. See section V of the class definition of Class 299 for the line.

588, Hazardous or Toxic Waste Destruction or Containment, subclasses 249+ for the containment of hazardous or toxic waste in underground areas.

- 133 Vertical:**  
This subclass is indented under subclass 132. Method or apparatus wherein the passageway is generally perpendicular to the earth's surface.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
8+, for pressurized caissons.  
231+, for a hollow pier or caisson, which may be subsequently filled, employed as a foundation structure.  
272, for a temporary caisson or other shoring means employed in a shaftlike excavation.
- SEE OR SEARCH CLASS:  
166, Wells, subclasses 242.1+ for well casing not sunk by a caisson or the like; and subclasses 378+ and 381+ for methods of constructing or assembling a well involving more than merely sinking a shaft by a caisson or the like or using means for sinking a shaft other than a caisson or the like.
- 134 Sectional:**  
This subclass is indented under subclass 132. Method or apparatus wherein the tunnel is formed of performed segments each of which is a circumferentially complete portion of the tunnel.
- 135 Seal or joint:**  
This subclass is indented under subclass 134. Method or apparatus wherein means are provided to prevent material passing between adjacent tunnel sections or for coupling the sections to one another or the the completed tunnel.
- SEE OR SEARCH CLASS:  
285, Pipe Joints or Couplings, appropriate subclasses for a pipe seal or joint.
- 136 Subaqueous:**  
This subclass is indented under subclass 132. Method or apparatus wherein the tunnel is located beneath the surface of a body of water.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
158+, for subaqueous placement of a pipe-line or cable.
- 137 Below bed:**  
This subclass is indented under subclass 136. Method or apparatus wherein the finished tunnel lies entirely below the surface of the earthen formation underlying the body of water.
- 138 Boring:**  
This subclass is indented under subclass 132. Method or apparatus wherein a subterranean corridor is formed by penetrating an earthen formation without disturbing the overlying earth.
- SEE OR SEARCH CLASS:  
175, Boring or Penetrating the Earth, subclass 62 for a process of boring horizontal bores.
- 139 With auxiliary tunnel:**  
This subclass is indented under subclass 138. Method or apparatus wherein a subsidiary passage is employed in the construction of the main corridor.
- 140 By axially overlapped members:**  
This subclass is indented under subclass 138. Method or apparatus wherein a plurality of plates or poles are sequentially driven into the earth surrounding the corridor cross sections such that each plate or pole partially extends over the next longitudinally adjacent plate or pole.
- 141 Shield:**  
This subclass is indented under subclass 138. Method or apparatus wherein a protective member movable with the progress of the work temporarily supports the walls of the corridor to prevent the surrounding material from falling into the corridor during excavation.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
283, for shield-type apparatus employed in trench forming.



**142 With transverse force application feature:**  
This subclass is indented under subclass 141. Method or apparatus wherein the shield is urged into contact with the walls of the corridor surrounding the shield.

**143 Direction control:**  
This subclass is indented under subclass 141. Method or apparatus wherein the course or rotation of the shield is regulated.

**144 Door or bulkhead:**  
This subclass is indented under subclass 141. Method or apparatus including either a movable closure for closing off a portion of the entrance into the shield or a partition adjacent the face of the tunnel which allows the face region to be pressurized.

**145 Discrete independently advanceable earth support segments:**  
This subclass is indented under subclass 141. Method or apparatus wherein each of a plurality of separate soil-sustaining sections is individually moved forward.

**146 Lining installation:**  
This subclass is indented under subclass 141. Method or apparatus wherein the shield includes means for erecting tunnel segments or for grouting the tunnel wall.

**147 Seal:**  
This subclass is indented under subclass 141. Method or apparatus including means which prevent the passage of material between a tunnel lining and the shield tail section.

**148 Work platform:**  
This subclass is indented under subclass 138. Method or apparatus wherein an artificial support for equipment or personnel is provided.

SEE OR SEARCH CLASS:

182, Fire Escape, Ladder, or Scaffold, appropriate subclasses for a work platform in general.

**149 Cut and cover:**  
This subclass is indented under subclass 132. Method or apparatus relating to a tunnel constructed by excavating a trench into the earth,

forming the tunnel cross section in the trench, and covering the trench.

SEE OR SEARCH THIS CLASS, SUBCLASS:

282+, for temporary trench shoring.

**150.1 Lining:**  
This subclass is indented under subclass 132. Method or apparatus relating to constructing the finished cross section of a tunnel by forming a shell or cast in place wall structure inside a bored hole.

(1) Note. Patents placed as originals in this and indented subclasses must claim either a method or apparatus for constructing the shell or wall structure or the specific wall structure, per se.

**150.2 By spraying of settable material (e.g., concrete):**  
This subclass is indented under subclass 150.1. Subject matter wherein the wall, ceiling or floor structure is formed by projecting hardenable material onto the interior of said tunnel.

SEE OR SEARCH CLASS:

264, Plastic and Nonmetallic Article Shaping or Treating: Processes, subclasses 31+, for forming structural installations in situ.

**151 Panel:**  
Method or apparatus under subclasses 150.1+ wherein a plurality of complementary, circumferentially arranged segments are assembled together to form the shell.

(1) Note. Bricks are not considered to be panels for this or the indented subclasses. Thus, a tunnel shell which is merely a brick wall will not be found herein.

**152 With sealing feature:**  
This subclass is indented under subclass 151. Method or apparatus wherein a gasket or a hardenable material is placed between or around the area of contact between adjacent segments.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 135, for seals between circumferentially continuous tunnel sections placed end-to-end.
- 275, and 279, for sheet piles with sealing features.

SEE OR SEARCH CLASS:

- 277, Seal for a Joint or Juncture, for a generic sealing means or process, subclasses 628+ for a static contact seal for other than an internal combustion engine, or a pipe, conduit, or cable.

**153 With separate fastening means between adjacent panels:**

This subclass is indented under subclass 151. Method or apparatus wherein each platelike segment is assembled to each adjacent segment by a discrete securing means.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 135, for means to secure one circumferentially continuous tunnel section to another.

**154.1 SUBTERRANEAN OR SUBMARINE PIPE OR CABLE LAYING, RETRIEVING, MANIPULATING, OR TREATING:**

This subclass is indented under the class definition. Subject matter comprising a step or means for (1) placing, (2) recovering, (3) handling, or (4) working upon a conduit or string of relatively slender material beneath the surface of the earth or a body of water.

- (1) Note. For classification under this definition, a step or means for (a) submerging the pipe or cable beneath the surface of a body of water, (b) forming an earth opening or otherwise handling the earth material, or (c) working upon the pipe or cable while in a subterranean or submarine position must be claimed.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 132, for subject matter relating to the formation of an underground passage-

way (e.g., tunnel) for the passage of personnel, vehicles, or equipment.

SEE OR SEARCH CLASS:

- 29, Metal Working, appropriate subclasses for an assembling process or apparatus.
- 37, Excavating, appropriate subclasses for means to form a trench.
- 111, Planting, appropriate subclasses for a process or device for agricultural-type planting.
- 138, Pipes and Tubular Conduits, subclass 97 for a process or means for repairing a pipe or tubing which is not in a subterranean or submarine position and subclass 108 for an underground pipe or conduit for pipe.
- 166, Wells, subclass 376, 377, and 378 for placing, removing, constructing, or assembling well elements.
- 174, Electricity: Conductors and Insulators, subclass 37 for underground electrical installations and subclass 68.1 for electrical conduit structure.
- 175, Boring or Penetrating the Earth, appropriate subclasses for means for forming a bore. The mere description that the tubing or the like which is used in the boring operation, is left in the earth, does not preclude classification in Class 175. See the class definition of Class 175 for the line between Class 405 and Class 175.
- 404, Road Structure, Process, or Apparatus, particularly subclass 2 for conduits combined with pavement curb or gutter structure.
- 414, Material or Article Handling, subclass 745.4 for apparatus for laying pipe without earth handling or excavating means.

**155 Cast in situ:**

This subclass is indented under subclass 154.1. Method or apparatus including a step or means for forming at least a portion of the string or conduit by placing flowable material in approximately the position in which it is to be used, said flowable material thereafter setting or congealing into a stable mass.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

150.1+, for a cast in situ tunnel lining.

SEE OR SEARCH CLASS:

166, Wells, subclasses 285+ for a process of cementing wells.

264, Plastic and Nonmetallic Article Shaping or Treating: Processes, subclasses 31+ for methods of casting conduit in situ, without any earth handling.

425, Plastic Article or Earthenware Shaping or Treating: Apparatus, subclass 59 and 63+ for apparatus for casting pipes or conduits in situ, but without any handling of the earth.

#### **156 With forming or cutting of pipe or cable:**

This subclass is indented under subclass 154.1. Method or apparatus including a step or means for either (a) serving or machining the string or conduit, or (b) either plastically shaping stock material into the form of a string or conduit or plastically shaping an already formed string or conduit so as to alter its cross sectional configuration.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

168.1+, for methods and apparatus for submerging a line of pipe or cable and controlling or causing the deformation of the same in a direction transverse to its longitudinal axis.

SEE OR SEARCH CLASS:

72, Metal Deforming, subclasses 48+ and 176+ for processes and apparatus for forming tubes by plastically deforming a strip of stock material.

#### **157 With protection or indication of pipe or trench:**

This subclass is indented under subclass 154.1. Method or apparatus wherein a ditch is formed into which the conduit or string is to be laid, and wherein means is provided to guard against damage or injury either to the conduit or string or to people who may be in the ditch, or wherein means is provided to show where the conduit or string is subsequently buried under the surface of the earth.

- (1) Note. The protection means prevents the trench wall from caving in or protects the pipe from being damaged after it is covered by earth. The indicator means may be positioned permanently or temporarily.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

282+, for trench shoring, per se.

SEE OR SEARCH CLASS:

138, Pipes and Tubular Conduits, subclass 104 for conduit combined with indicator means; and subclass 105 for conduit combined with a trench feature.

#### **158 Submerging, raising, or manipulating line of pipe or cable in or from marine environment:**

This subclass is indented under subclass 154.1. Method or apparatus wherein the string or conduit is placed or manipulated beneath the surface of a body of water or retrieved therefrom.

#### **159 Entrenched or buried:**

This subclass is indented under subclass 158. Method or apparatus wherein the string or conduit is positioned beneath the bottom earth surface of the body of water.

SEE OR SEARCH CLASS:

37, Excavating, subclasses 307+ for dredgers for excavating beneath a body or water.

175, Boring or Penetrating the Earth, subclasses 5+, for subject matter relating to boring a submerged formation.

#### **160 Condition responsive:**

This subclass is indented under subclass 159. Method or apparatus wherein the string or conduit is positioned beneath the bottom by a device having means for sensing a characteristic (e.g., tension in a line, surface contour of the bottom) or the occurrence of a predetermined event in the device, its environment, or the string or conduit, and regulating or modifying the operation of the device in accordance with said sensed characteristic or event.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

175, for condition-responsive apparatus for burying pipe or cable in the earth surface, but not under a body of water.

**161 Entrenching or burying apparatus guided by pre-positioned pipe or cable:**

This subclass is indented under subclass 159. Method or apparatus wherein the string or conduit is initially positioned on and along the bottom of the body of water, and is subsequently positioned beneath the bottom by a device having means to engage the string or conduit and guide the device along the same.

**162 With apparatus buoyancy control:**

This subclass is indented under subclass 161. Method or apparatus in which the device guided along the string or conduit includes variable ballast means whereby the attitude or the distance below the water surface of the device is controlled while the device is positioning the string or conduit beneath the bottom.

- (1) Note. A burying or entrenching device having the ballast means the sole purpose of which is to sink the device down to its working position and raise the same therefrom is excluded.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

205+, for marine structures which are sunk or have their attitude controlled by ballasting means.

SEE OR SEARCH CLASS:

114, Ships, subclasses 319+ for submarines with ballasting means.

**163 With bottom fluidizing means:**

This subclass is indented under subclass 161. Method or apparatus wherein an initially relatively firm bottom material supporting the pre-positioned string or conduit is caused to assume a flowable state, thereby permitting the string or conduit to settle into a position beneath the bottom.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

13, for a box caisson or cofferdam employing fluidizing or jetting means to sink the same.

226, for subject matter relating to securing a marine structure to the bed by jetting.

248, for pile installation using fluid jets.

SEE OR SEARCH CLASS:

37, Excavating, subclass 323 and 342+ for dredging by jetting.

**164 By towing submerged sled with attached plow and pipe or cable guide:**

This subclass is indented under subclass 159. Method or apparatus wherein the string or conduit is positioned beneath the bottom by a device having means by which it may be connected to a vessel to pull the device along the bottom, and further comprising a digging tool having integral or attached means for restricting lateral movement of the string or conduit as the same travels from a supply to its final position beneath the bottom.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

180+, for a trench forming tool with attached pipe or cable guide employed to bury the pipe or cable at other than a submerged site.

**165 With means to forcibly feed or to control tension in pipe or cable:**

This subclass is indented under subclass 164. Method or apparatus wherein either (a) the string or conduit is in the form of an elongated flexible member and means are provided whereby a force transmitted along the member tending to pull the buried or entrenched portion of the same out of the bottom can be lessened or neutralized or (b) a motive force is provided to feed the string or conduit from a supply toward its final position beneath the bottom.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

177, for land apparatus for burying pipe or cable provided with means to feed or control tension in the pipe or cable.

**166 Facilitated by extension from line-laying vessel:**

This subclass is indented under subclass 158. Subject matter wherein the string of slender material or conduit is carried in a ship that releases the string or conduit so that it is placed as the ship moves through the water, and wherein the ship is provided with means protruding beyond the hull of the ship, which protruding means helps to support the string or conduit for proper placement of the same as it is released from the ship.

- (1) Note. Included in this subclass is an extension that extends above the deck of the line-laying ship. The extension serving to facilitate assembly of the sections of pipe just prior to their being laid into the water.

**167 Articulated segments:**

This subclass is indented under subclass 166. Method or apparatus wherein the protruding means comprises a plurality of serially connected distinct sections, each of which is swingably attached to an adjacent section.

**168.1 With causing or controlling the deformation of a line:**

This subclass is indented under subclass 158. Method or apparatus wherein the conduit or string is in the form of an elongated member having a stress limit beyond which plastic deformation occurs, and a step or means is recited to either (a) ensure that the stress limit is not exceeded during placement of the string or conduit or (b) to straighten or otherwise alter the longitudinal configuration of the string or conduit as the same is transferred from a supply to its final position below the water surface.

- (1) Note. Included in this subclass is a step or means for bending a pipe from a coiled configuration to a substantially straight-line configuration or from a substantially straight-line configuration into a desired curved configuration.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 156, for a step or means for altering or forming the cross-sectional configura-

tion of a pipe or cable by machining or plastically deforming the same.

- 168.3, for pipe laying from a reel on a floating means.

**168.2 Buckle arrestor for pipe:**

This subclass is indented under subclass 168.1. Subject matter comprising means to prevent a conduit which is being layed from floating means from bending, kinking or collapsing.

**168.3 Pipe laying from a reel:**

This subclass is indented under subclass 168.1. Subject matter wherein a conduit which is wound on a reel and layed on, or under, the bed of a body of water from floating means carrying the reel.

**168.4 Pipe tensioner:**

This subclass is indented under subclass 168.1. Subject matter comprising means to apply tensile force to a conduit, to control its configuration, as it is being layed from floating means.

**169 With assembling of line structure:**

This subclass is indented under subclass 158. Method or apparatus wherein the string or conduit or a portion thereof is connected either to a fixed construction or to another string or conduit or portion thereof.

- (1) Note. In this subclass is a pipe connected to a structure such as a well head, or to an anchor on the marine floor.

**170 By joining successive sections of line:**

This subclass is indented under subclass 169. Method or apparatus wherein one portion of a string or conduit is connected to another portion of a string or length of conduit in end-to-end fashion.

**171 By control of buoyancy:**

This subclass is indented under subclass 158. Method or apparatus wherein the string or conduit is at least partially floatable, and is properly placed by regulating the floatability thereof.

- (1) Note. The pipe may be made buoyant by using air trapped therewithin, or by attaching float members to the pipe, or ballast material may be added to the pipe to regulate the sinking thereof.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 200, for use of a buoyant chamber to adjust the height of a work platform.
- 205+, for method or apparatus for sinking or orienting a marine structure in a body of water.

**172 With anchoring of line:**

This subclass is indented under subclass 158. Method or apparatus wherein the conduit or string of slender material is secured to the bottom of the body of water into which said string or conduit has been placed.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 224+, for subject matter relating to anchoring a marine structure to the bed.

**173 With raising of line from marine floor:**

This subclass is indented under subclass 158. Method or apparatus wherein significance is attributed to the lifting of the conduit or string of slender material from the bottom of the body of water into which it has been placed.

**174 By means advancing along terrain and guiding pipe or cable into subterranean position:**

This subclass is indented under subclass 154.1. Method or apparatus wherein a means is utilized which moves continuously substantially parallel to the axis of the placed string or conduit to guide or direct said string or conduit from a position above the earth surface to a final, substantially fixed position below the surface.

- (1) Note. Included herein are method and apparatus wherein only a portion or portions of the length of the string or conduit is positioned below the surface.

**175 Condition responsive:**

This subclass is indented under subclass 174. Method or apparatus wherein the string or conduit is positioned beneath the surface by a device having means for sensing a characteristic (e.g., tension in the string or conduit, surface contour) or the occurrence of a predetermined event in the device, its environment, or the string or conduit, and regulating or

modifying the operation of the device in accordance with said sensed characteristic or event.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 160, for condition-responsive apparatus for entrenching a line of pipe or cable in the bottom earth surface of a body of water.

**176 Tape or strip:**

This subclass is indented under subclass 174. Method or apparatus relating to the placement of an elongated, generally ribbonlike member beneath the surface of the earth.

SEE OR SEARCH CLASS:

- 111, Planting, subclass 199 for similar structures relating to the placement of seed tapes in the ground.

**177 With positive feed or means to vary tension in pipe or cable:**

This subclass is indented under subclass 174. Method or apparatus wherein either (a) the string or conduit is in the form of an elongated flexible member and means are provided whereby a force transmitted along the member tending to pull the entrenched or buried portion from below the surface can be lessened or neutralized, or (b) a motive force is provided to feed the string or conduit from a supply toward its final position below the surface.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 165, for apparatus or methods for entrenching pipe or cable in the bottom earth surface of a body of water, combined with feeding or tensioning means.
- 168.1+, for submarine pipe laying apparatus having means to control tension and other stresses in the pipe as it is transferred from the surface to the bottom.

**178 Simultaneous laying of plural parallel pipes or cables:**

This subclass is indented under subclass 174. Methods or apparatus relating to the concurrent placement of two or more parallel strings or conduits below the earth surface.

**179 With backfill or bedding material conveying or dispensing means:**

This subclass is indented under subclass 174. Methods or apparatus wherein either (a) a bottom layer of material is placed in a trench prior to the placement of the string or conduit therein, or (b) a covering material is either dispensed from a supply hopper or conveyed from the point at which it was removed from the trench, and is deposited upon a string or conduit which has been positioned in the trench.

- (1) Note. A mere crowder for replacing excavated earth from the side of the trench is not considered to be a conveyor or dispenser as required above.

**SEE OR SEARCH CLASS:**

- 37, Excavating, subclasses 368+ for a ditching machine combined with a conveyor.

**180 Including trench forming plow with pipe or cable guide:**

This subclass is indented under subclass 174. Method or apparatus wherein the means for placing the string or conduit below the surface includes a plowlike digging tool for forming a trench for receiving said string or conduit, and means integral with or attached to said tool for restricting lateral movement of the string or conduit as the same travels from a supply to its final position below the surface.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 164+, for underwater apparatus for entrenching a line of pipe or cable and including a plow with a pipe or cable guide.

**SEE OR SEARCH CLASS:**

- 37, Excavating, subclasses 366+ for a ditching plow.  
172, Earth Working, for earthworking plows.

**181 With depth adjustment:**

This subclass is indented under subclass 180. Method or apparatus wherein the plowlike tool can be adjusted relative to its supporting structure whereby the vertical dimension of the trench can be selectively varied.

**182 With plow vibrating or oscillating means:**

This subclass is indented under subclass 180. Method or apparatus including means to move the digging tool to and fro to assist the same in penetrating the earth.

**183 Guide integral with or rigidly fixed to plow:**

This subclass is indented under subclass 180. Method or apparatus wherein the means for restricting lateral movement of the string or conduit is either formed by machining part of the plowlike tool or is comprised of a separate part fastened to the tool in such a manner that it cannot be adjusted or moved relative to the tool.

**183.5 Moving cable within pipe:**

This subclass is indented under subclass 154.1. Subject matter for advancing or withdrawing a thin, flexible elongate member within a larger, hollow, more rigid elongate member.

**SEE OR SEARCH CLASS:**

- 254, Implements or Apparatus for Applying Pushing or Pulling Force, subclass 134.3 for a method or apparatus for pulling a conductive wire.

**184 Advancing subterranean length of pipe or cable:**

This subclass is indented under subclass 154.1. Method or apparatus wherein a means is utilized to positively advance the string or conduit through a bore or other excavation in the earth, usually by pushing or pulling said string or conduit.

**SEE OR SEARCH CLASS:**

- 37, Excavating, subclass 370 for mole plows.  
166, Wells, subclass 50 for a well with a lateral conduit which may have been inserted into a bore by pushing or pulling; subclass 71 for a well with a below-ground feature and an above-ground casing sinking means; and subclasses 77.1+ for above-ground apparatus for forcing tubing or cable into an existing well.  
173, Tool Driving or Impacting, subclass 141 for a tool drive means provided with an advance causing or controlling means.

- 175, Boring or Penetrating the Earth, appropriate subclass for means to form a bore including a means to feed a drill string, and particularly subclasses 22+ for subject matter relating to boring without earth removal in which a special provision is included for forming a cased bore as a part of the boring operation; and subclass 171 for an above-ground tool drive combined with a means to install a casing as part of the boring operation. See the class definition of Class 175 for the line between Class 405 and Class 175.
- 254, Implements or Apparatus for Applying Pushing or Pulling Force, appropriate subclass for pushing or pulling devices, particularly subclasses 29+ for pipe or rod jacks; and subclasses 134.3+ for wire or strand placing in which a pushing or pulling device is utilized.
- 184.1 Repair, replacement, or improvement:**  
This subclass is indented under subclass 154.1. Subject matter wherein the pipe or cable is (1) restored to a sound or healthy state, (2) exchanged or substituted with another pipe or cable, or (3) otherwise enhanced so as to increase performance.
- SEE OR SEARCH CLASS:  
138, Pipes and Tubular Conduits, subclass 97 for the repairing of pipes not underground or underwater, or not dealing with the manipulation of the underground or underwater pipe during the repairing process.
- 184.2 Installing liner:**  
This subclass is indented under subclass 184.1. Subject matter for covering or sealing at least a portion of the pipe for the purpose of repairing or improving the performance of the pipe.
- SEE OR SEARCH CLASS:  
156, Adhesive Bonding and Miscellaneous Chemical Manufacture, appropriate subclasses for the adhesive bonding of a liner to a pipe.
- 264, Plastic and Nonmetallic Article Shaping or Treating: Processes, appropriate subclasses for a process of shaping a liner within a pipe.
- 184.3 Pipe splitting, breaking, or expanding:**  
This subclass is indented under subclass 184.1. Subject matter for (1) bursting apart the pipe by dividing lengthwise, or (2) separating the pipe into parts for the eventual replacing of the pipe, or (3) broadening the inner passage of the pipe for improving the performance of the pipe.
- SEE OR SEARCH CLASS:  
30, Cutlery, subclass 92 for a pipe cutter.
- 184.4 Supporting, anchoring, or positioning of pipe or cable:**  
This subclass is indented under subclass 154.1. Subject matter including means for (1) holding or propping up, (2) securing, or (3) arranging the pipe or cable according to a desired position.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
172, for the anchoring of a pipe or cable in a marine environment.
- SEE OR SEARCH CLASS:  
248, Supports, appropriate subclasses for supports of the general type not further including subterranean or submarine pipe or cable manipulation or installation detail.
- 184.5 Plural pipe sections:**  
This subclass is indented under subclass 154.1. Subject matter wherein multiple pipe sections are laid, retrieved, or manipulated in a subterranean location.
- 185 Diving:**  
This subclass is indented under the class definition. Method or apparatus wherein (a) means are provided within which personnel may be lowered into a body of water to perform a submerged operation, or (b) a submersible means is provided which is either remotely controlled by personnel at the water surface or is operated or occupied by a diver to perform an underwater operation.



- (1) Note. Apparatus which are solidly connected to the marine floor (e.g., marine drilling platform) and methods associated therewith are excluded, even though the apparatus may eventually be moved to another site.
- (2) Note. This subclass includes observation bells which are submerged by cable to a position under the water surface.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 8+, for a pressurized caisson with continuous surface access (land or water use).
- 11+, for means to expose a normally wetted surface to the atmosphere, especially subclass 12 for ship repair caissons.
- 158+, for method or apparatus for submerging, raising, or manipulating a line of pipe or cable in a body of water.
- 195.1+, for a marine structure or method of constructing the same.

**SEE OR SEARCH CLASS:**

- 114, Ships, subclasses 312+ for submarine vessels without specific means for performing an underwater work operation.

**186 Suits or accessory therefor:**

This subclass is indented under subclass 185. Apparatus shaped to approximate the form of the body and limbs of a wearer, and accessories therefor which are not provided for elsewhere.

**SEE OR SEARCH CLASS:**

- 2, Apparel, subclasses 2.15+ for diving suit structure, per se.
- 128, Surgery, subclass 201.27 for diving or swimming apparatus.
- 441, Buoys, Rafts, and Aquatic Devices, subclasses 56 and 102+ for diving suits not including hydraulic engineering apparatus, but equipped with buoyant structure or swimming feature.

**187 Rigid element:**

This subclass is indented under subclass 186. Apparatus formed with a relatively inflexible material to protect the wearer from the pressure of the water.

**188 Underwater docking or mooring:**

This subclass is indented under subclass 185. Method or apparatus wherein means are provided for temporarily attaching a diving apparatus to either the seabed, a submerged structure or vessel, or a submerged portion of a structure or vessel to restrain movement of said apparatus with respect to said structure or vessel.

- (1) Note. A cable by which a diving bell is lowered into the water or a tether connecting the bell to the mother ship are not "attaching means" as required by the above definition.
- (2) Note. Included in this subclass are submersible apparatus which engage a portion of an underwater pipeline to be repaired.

**189 With communication between inhabitable enclosures:**

This subclass is indented under subclass 188. Method or apparatus in which the diving apparatus comprises a compartment containing a breathable gaseous environment and a hatchway leading to the same, and means are provided for attaching said diving apparatus to a submerged vessel or structure which also includes a compartment, whereby the compartments of diving apparatus and the vessel or structure are in communication with each other via said hatchway.

**SEE OR SEARCH CLASS:**

- 114, Ships, subclasses 330+ for submarines including a rescue feature.

**190 Remote control:**

This subclass is indented under subclass 185. Method or apparatus wherein the underwater operation is performed at a site by a device which has its operation controlled by a person located in an environment isolated from said underwater site through manipulation of controls in said isolated environment which are

interconnected with said device through motion transmission means.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

188+, for a diving apparatus having means for attaching itself to a sunken vessel, and including a drill or tap operated from the interior of said apparatus.

**191 From surface:**

This subclass is indented under subclass 190. Method or apparatus wherein the isolated environment is located at or above the water surface.

**192 With air lock:**

This subclass is indented under subclass 185. Method or apparatus wherein the means with which personnel may carry on the underwater operation comprises an underwater enclosure having a gaseous environment in which a specific pressure condition is maintained, and wherein a chamber means is provided having a first sealable opening communicating with said enclosure, and a second sealable opening communicating with the underwater environment, whereby passage of material or personnel into or out of the enclosure can be accomplished while maintaining the pressure condition within the enclosure.

**193 With pressure equalization:**

This subclass is indented under subclass 185. Method or apparatus wherein the means with which personnel may carry on the underwater operation comprises an enclosure confining a gaseous environment which is maintained at a pressure equal to or greater than the surrounding water pressure to prevent ingress of water through an opening.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

8+, for pressurized pneumatic caissons which have a portion extending above the surface of the body of water within which it is located, which portion allows access to the interior of the caisson.

**194 With continuous surface access:**

This subclass is indented under subclass 185. Method or apparatus wherein the means with which personnel may carry on an underwater operation includes an uninterrupted passageway between the water surface and an underwater site.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

8+, for pressurized pneumatic caissons which have a portion extending above the surface of the body of water within which it is located, which portion allows access to the interior of the caisson.

**195.1 MARINE STRUCTURE OR FABRICATION THEREOF:**

This subclass is indented under the class definition. Method or apparatus relating to (a) a building, platform, foundation, or similar construction located in a body of water and which is supported by or solidly connected to an earthen formation or (b) the on-site erection of such a building, platform, foundation or similar construction in a manner not provided for elsewhere.

(1) Note. The term "solidly connected" as used herein includes hinged or universal-type joints.

(2) Note. The earthen formation usually comprises the bed of the body of water.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

136+, for subaqueous tunnels.

299+, for foundations not restricted to a marine environment.

SEE OR SEARCH CLASS:

114, Ships, subclasses 264+ for moored or anchored marine platforms which are not supported by or solidly connected to the seabed. Class 405, however, includes structures connected to the marine bed by a continuous riser pipe (i.e., a conduit which serves to convey material from beneath the surface of the water) which may comprise a rigid segment over a substantial portion of

- its length and a relatively flexible segment.
- 175, Boring or Penetrating the Earth, subclasses 5+ for marine structures combined with features specialized for drilling such as a tool drive or means for guiding a tool from the drill rig to the marine floor. Nominal recitations of drilling means, details of a derrick or draw works or mere access spaces communicating with the surface of the water have not been considered to involve specialized drilling features. Steps or apparatus relating to boring to form a foundation, anchor, etc., for the structure, combined with steps or means relating to the structure are classified in Class 405.
- 588, Hazardous or Toxic Waste Destruction or Containment, subclass 250 for containment of hazardous or toxic waste in a marine environment to include securing the waste to the earthen formation.
- 196 With work deck vertically adjustable relative to floor:**  
This subclass is indented under subclass 195.1. Method or apparatus wherein the construction includes a platform on which, or from which a work operation is to be performed, which platform is supported by one or more elongated columnar members that are secured to the bed underlying body of water, and which platform is movable up and down with relation to the member(s) and the bed.
- 197 Sectional leg:**  
This subclass is indented under subclass 196. Method or apparatus wherein a columnar member is composed of a plurality of interconnected or nested segments.
- 198 Longitudinally extending projections or recesses:**  
This subclass is indented under subclass 196. Method or apparatus wherein a plurality of regularly spaced protuberances, indentations, or apertures are arranged along the length of a columnar member and means are provided to co-operate with said protuberances, indentations, or apertures to effect raising or lowering of the platform.
- 199 Frictional grippers:**  
This subclass is indented under subclass 196. Method or apparatus wherein the platform is provided with means which clamp against the generally smooth exterior of a columnar support, which means effects vertical movement of the platform relative to its support.
- 200 By buoyancy control:**  
This subclass is indented under subclass 196. Method or apparatus wherein support for the platform is by way of a floatable chamber, the floatability of which a chamber is varied to cause the platform to be moved up and down with relation to the bed.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
205+, for a buoyant chamber used to facilitate assembly of a structure.
- 201 With horizontally movable work deck:**  
This subclass is indented under subclass 195.1. Method or apparatus wherein the construction includes a platform on which, or from which a work operation is to be performed, which platform is mounted so as to be shiftable relative to its support, the shifting occurring in a plane substantially parallel to the water surface.
- 202 With pivotal connection between work deck and base:**  
This subclass is indented under subclass 195.1. Method or apparatus wherein the construction includes a platform on which, or from which a work operation is to be performed, which platform is attached by a shaft or bearing to a supporting portion of the construction such that a limited degree of oscillation between said supporting portion and the platform is permitted.
- 203 Floatable to site and supported by marine floor:**  
This subclass is indented under subclass 195.1. Method or apparatus wherein the construction is itself buoyant in water or has attached thereto separate buoyant transport means, whereby the construction may be moved on the surface of a body of water until it is located in a position where the construction will be used, at which position the construction, or a portion thereof, is submerged into contact with the bottom of the body of water.

- (1) Note. The buoyant means may or may not be eventually disassociated from the rest of the organization.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
13, for a cofferdam floatable to a work site.
- 204 With assembly of sectional supporting structure at site:**  
This subclass is indented under subclass 203. Method or apparatus wherein the construction includes elongated supporting means adapted to extend between a work platform and the seabed, said supporting means comprising a plurality of separate sections that are assembled at the position where the platform will be used.
- 205 With ballasting means to sink or position structure at site:**  
This subclass is indented under subclass 203. Method or apparatus wherein the construction includes or has attached thereto one or more buoyant compartments into which a material is selectively introduced to decrease the buoyancy of said compartment(s), whereby the construction can be submerged or its orientation can be regulated.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
23, for wave or flow dissipating structures which are floated to a site and sunk.  
171, for submerging a line of pipe or cable by controlling the buoyancy thereof.  
200, for marine platforms which are adjusted vertically through buoyancy control.
- 206 Detachable from structure:**  
This subclass is indented under subclass 205. Method or apparatus wherein the buoyant compartment is distinct from and removably attached to the construction.
- 207 Compartment in base:**  
This subclass is indented under subclass 205. Method or apparatus wherein the construction includes and is supported upon a foundation within which is located the buoyant compartment(s), which foundation, or one or more elongated columnar members suspended therefrom, contacts the earthen bed underlying the body of water.
- 208 And leg depending from base:**  
This subclass is indented under subclass 207. Method or apparatus wherein the foundation includes elongated columnar members suspended therefrom that contact, and are secured to, the bed, which members help support the foundation on which the construction rests.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
227, for securing a marine structure to the bed by driving piles through sleeves provided in the structure.
- 209 Separable transport means:**  
This subclass is indented under subclass 203. Method or apparatus including a step or means for floating the construction to the site on a separate buoyant conveyance.
- (1) Note. Since practically all nonbuoyant marine structures are presumably carried to a site on some type of buoyant transport means, some significance should be attributed to the method or means for transporting the structure for placement of a patent in this subclass.
- 210 Storage container:**  
This subclass is indented under subclass 195.1. Method or apparatus wherein a product receiving receptacle is secured to and supported by the earthen bed of the body of water.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
53, for fluid storage in an earthen cavity.
- SEE OR SEARCH CLASS:  
114, Ships, subclass 256 and 257 for semisubmersible or submersible product containing tanks that either are anchored in place or are towed through the water.  
220, Receptacles, appropriate subclasses for a metallic storage container, per se.

**211 Structure protection:**

This subclass is indented under subclass 195.1. Method or apparatus wherein means are provided that guard against damage to the structure.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

61, for method or apparatus for confining, regulating, or inhibiting the formation of ice on a body of water in which a marine structure is located, which may comprise means on the structure itself.

SEE OR SEARCH CLASS:

14, Bridges, subclass 76 for bridge piers provided with ice removers.

**211.1 Corrosion prevention:**

This subclass is indented under subclass 211. Subject matter comprising means for preventing deterioration of a structure by chemical action.

**212 Fender:**

This subclass is indented under subclass 211. Method or apparatus wherein a shock absorbing structure is provided to lessen vessel impact.

SEE OR SEARCH CLASS:

14, Bridges, subclass 76 for bridge piers with fenders.  
114, Ships, subclasses 219+ for shipboard fenders.  
267, Spring Devices, subclasses 139+ for shock-absorbing bumpers in general.  
293, Vehicle Fenders, appropriate subclasses for a fender for a moving vehicle, and particularly subclasses 107+, 129, 131, and 132+ for vehicle bumpers having special means to absorb the force of impact.

**213 Roller type:**

This subclass is indented under subclass 212. Method or apparatus wherein the shock-absorbing structure includes a freely turning cylindrical body.

**214 Having coil spring:**

This subclass is indented under subclass 212. Method or apparatus wherein a helix of resilient material is provided to dampen vessel impact.

**215 Resilient block:**

This subclass is indented under subclass 212. Method or apparatus wherein vessel impact is absorbed by a mass of elastomeric material.

**216 Sleeve or coating:**

This subclass is indented under subclass 211. Method or apparatus wherein the structure is protected by a shell or facing constructed on or assembled to the exterior of said structure, or by a substance applied to the exterior to form a layer thereon.

SEE OR SEARCH CLASS:

52, Static Structures (e.g., Buildings), subclasses 721.1+, 736.3+, and 738.1 for a shaft having a dissimilar shell or facing.  
249, Static Molds, subclass 1 for apparatus for molding a protective coating on a pile.

**217 In or on frozen media:**

This subclass is indented under subclass 195.1. Method or apparatus wherein the structure is located in an environment of ice, snow, or below-freezing temperature.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

130+, for temperature modification or control of an earthen formation.

SEE OR SEARCH CLASS:

166, Wells, CROSS-REFERENCE ART COLLECTION 901 for a collection of subject matter relating to permafrost.

**218 Dock:**

This subclass is indented under subclass 195.1. Method or apparatus relating to a mooring platform which either is solidly connected to or is carried by an earthen formation.

SEE OR SEARCH CLASS:

114, Ships, subclass 258 for floating landing platforms, per se, or where such

platforms are anchored in place by a flexible chain, line, wire, etc.

**219 Floating:**

This subclass is indented under subclass 218. Method or apparatus wherein the mooring platform includes a buoyant section which rides on the surface of the body of water.

SEE OR SEARCH CLASS:

114, Ships, subclass 263 for floating boat docks not solidly connected to an earthen formation.

**220 Hinged:**

This subclass is indented under subclass 218. Method or apparatus wherein the mooring platform is composed of a plurality of sections which are pivotally connected to one another.

**221 Vertically adjustable:**

This subclass is indented under subclass 218. Method or apparatus wherein the height or the mooring platform can be varied with respect to the bed of the body of water.

**222 Cast in situ:**

This subclass is indented under subclass 195.1. Method or apparatus wherein the construction or a portion thereof is formed by placing a cementitious material at approximately the position at which the construction is to be located, and then permitting or causing the material to set or congeal into a stable mass.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

257, and see the search notes thereto, for cast in situ columnar structures not restricted to a marine environment.

**223 Installing means:**

This subclass is indented under subclass 222. Apparatus employed in forming the cast in situ structure and which does not remain as part of the finished structure.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

11+, for temporary caissons used in forming concrete piers, which caissons are removed after the pier is formed.

**223.1 Tension leg platform:**

This subclass is indented under subclass 195.1. Subject matter comprising an offshore platform which has depending members that are anchored to the bed of a body of water and hold the platform in position by being placed under tension.

**224 With anchoring of structure to marine floor:**

This subclass is indented under subclass 195.1. Method or apparatus relating to the fixing of the construction to the earthen bed of the body of water.

(1) Note. A patent claiming subject matter relating to a marine foundation (e.g., pile, pier) will be placed as an original in this and indented subclasses only if restricted to a marine environment.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

211+, for a marine pile with means for protecting the pile against damage, especially subclass 216 for a pile with a protective sleeve or coating.

**224.1 Pressure holding or loosening means:**

This subclass is indented under subclass 224. Subject matter comprising a suction means to hold the base of an offshore structure to the seabed or jet means to loosen the base from the seabed.

**224.2 By riser pipe:**

This subclass is indented under subclass 224. Subject matter comprising a conduit that extends from the bed of a body of water to anchor a platform on the surface of the water, and which also serves to convey material from beneath the surface of the water, (e.g., oil, gravel, etc.).

SEE OR SEARCH THIS CLASS, SUB-CLASS:

158+, for a process or apparatus for laying a pipe which serves to convey material from beneath the surface of the water, but does not anchor a structure to the bed of the body of water.

195.1, for riser pipes which do not anchor the structure to the bed of the body of water.

## SEE OR SEARCH CLASS:

- 137, Fluid Handling, subclass 236.1 for distribution systems involving geographic features and subclasses 356+ for static constructional installations.
- 441, Buoys, subclasses 4+ for liquid cargo transferring means.

**224.3 Having flexible segment:**

This subclass is indented under subclass 224.2. Subject matter wherein the conduit comprises a section which is unable to resist a compressive force along its longitudinal axis.

- (1) Note. The flexible segment may be used to tether a floating means to the substantially rigid section of the riser pipe.

**224.4 Having tensioner:**

This subclass is indented under subclass 224.2. Subject matter comprising means to apply tensile force to the conduit in order to control its geometric configuration.

**225 By grouting preformed structure:**

This subclass is indented under subclass 224. Method or apparatus wherein a preformed construction is made secure to the bed by applying a cementitious material about a portion of said construction.

## SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 260+, for a rock or earth bolt or anchor with a grouting feature.

**226 Including floor modifying means:**

This subclass is indented under subclass 224. Method or apparatus wherein the configuration or character of the earthen bed to which the construction is secured is changed.

- (1) Note. This subclass does not include the mere displacement or compaction of the earthen bed by a pile or portion of a construction which is forced or driven into the bed.
- (2) Note. The floor-modifying means may include means to impinge pressurized fluid against the surface, or subject it to vacuum, or means to dig into the surface. It usually provides a more secure

anchorage but may be used to loosen or decrease the anchoring effect.

## SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 163, for pipe or cable entrenching by earth fluidizing means.
- 248, for methods and apparatus for sinking columnar members in the earth using fluid jets.

**227 By pile extending through sleeve in structure:**

This subclass is indented under subclass 224. Method or apparatus wherein the construction includes a passageway or has attached thereto a tube, through which passageway or tube is passed an elongated member which is partially driven into the bed, thereby fixing the construction to the bed.

**228 Pile driving:**

This subclass is indented under subclass 224. Method or apparatus including a step or means for sinking into the bed a member which is greatly elongated relative to any lateral dimension.

**229 FOUNDATION:**

This subclass is indented under the class definition. Method or apparatus relating to a preformed or cast in situ structure positioned or formed in contact with the earth to provide a stable base for supporting a superstructure.

## SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 195.1+, for foundations peculiar to a marine environment.
- 263+, for a method or apparatus for stabilizing an earthen formation by applying a composition (e.g., cement) to the same.
- 271, for a method or apparatus for compacting an earthen formation.

## SEE OR SEARCH CLASS:

- 52, Static Structures (e.g., Building), subclasses 169+ for a construction there provided for with a terranean feature; subclass 274 for an intersecting construction with a foundation; and subclasses 292+ for a footing peculiar to the support of a wall or a shaft.

**230 Underpinning:**

This subclass is indented under subclass 229. Method or apparatus wherein the stable base is formed or positioned under an existing construction after which the weight of said construction is transferred to said stable base.

**231 Columnar structure (e.g., pier, pile):**

This subclass is indented under subclass 229. Method or apparatus wherein the stable base comprises a rigid member having a limited closed periphery and which is greatly elongated relative to any lateral dimension.

- (1) Note. This subclass includes bridge approaches with retaining wall type abutments (usually a reinforced wall).

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 195.1+, for a marine pile or a method of repairing the same.  
216, for a marine pile with a protective sleeve or coating.  
274+, for sheet piles.

SEE OR SEARCH CLASS:

- 14, Bridges, subclass 75 and 77.3 for piers specifically adapted to support bridge spans.  
52, Static Structures (e.g., Buildings), subclasses 720.1+ for shafts in general (e.g., utility pole).

**232 Process or apparatus for installing:**

This subclass is indented under subclass 231. Method or apparatus including a step or means for positioning or forming the elongated member in the earth in the position in which it is to be used.

- (1) Note. The means for constructing or placing a pile is a device which is not a part of the completed pile.

SEE OR SEARCH CLASS:

- 166, Wells, appropriate subclasses for processes and means for installing casing and other well structure.  
173, Tool Driving or Impacting, appropriate subclasses for means to impact an earth penetrating means which may be broadly claimed as a pile. Class 405

provides for a method of driving a pile.

- 175, Boring or Penetrating the Earth, appropriate subclasses for forming a hole for the reception of a pile.

**233 Casting in situ hardenable fluent material:**

This subclass is indented under subclass 232. Method or apparatus including a step or means for forming the elongated member or a portion thereof in approximately the position in which it is to be used by placing a flowable material (e.g., cement) and then permitting or causing the flowable material to set or congeal into a stable mass.

- (1) Note. Forming a foundation pile by mixing cementitious material with the earth in situ is considered earth treatment.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 222+, for cast in situ marine foundations and method and apparatus for constructing the same.  
267, for the formation of an underground construction by filling a subterranean cavity with cement, or by mixing cement with the earth in situ.

SEE OR SEARCH CLASS:

- 166, Wells, subclasses 285+ for cementing, plugging, or consolidating in a well, or well conduit.  
249, Static Molds, subclass 51 for a mold for forming a post in situ.  
264, Plastic and Nonmetallic Article Shaping or Treating: Processes, subclasses 31+ for a process of casting a structural installation in situ with no earth working claimed.  
425, Plastic Article or Earthenware Shaping or Treating: Apparatus, subclass 59 for apparatus for casting a construction wherein a subterranean feature is employed as a shaping means.

**234 With heating, cooling, or explosion:**

This subclass is indented under subclass 233. Method apparatus wherein the force generated by an explosive charge is utilized during installation of the elongated member, or a step or means is included for applying to or removing



- heat from the columnar member or an installing means.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
130+, for temperature modification or control of an earthen formation.
- SEE OR SEARCH CLASS:  
166, Wells, subclass 286 for a process of cementing a well including exploding; and subclass 288 for a process of cementing a well including heating.
- 235 With subsequent moving:**  
This subclass is indented under subclass 233. Method or apparatus including a step or means for moving the elongated member of a portion thereof after it has been formed in situ.
- 236 Subsurface dispensing of material for flow toward surface:**  
This subclass is indented under subclass 233. Method or apparatus in which the flowable material in being placed causes the preceding material to flow upward from the point at which it is introduced into the member being formed.
- 237 Forming subsurface enlargement:**  
This subclass is indented under subclass 233. Method or apparatus in which the configuration of the formed in situ member is such that a cross-sectional area below the surface in which the member is being formed will be greater than the cross-sectional area at the surface (e.g., the formation of a subsurface bulb or bulge).
- 238 Preformed enlargement cavity:**  
This subclass is indented under subclass 237. Method or apparatus including a step or means for forming an enlarged portion in an excavation prior to introducing a charge of flowable hardenable material therein to form the enlargement.
- 239 Providing embedded metallic reinforcement:**  
This subclass is indented under subclass 233. Method or apparatus including a step or means for positioning metallic material in the flowable material prior to the setting or congealing thereof for the purpose of reinforcement.
- 240 Dispensing fluent material while withdrawing dispenser:**  
This subclass is indented under subclass 233. Method or apparatus in which flowable material is delivered from an earth retaining form or a separate delivery means, and wherein the form or delivery means withdrawn from the earth as the flowable material is simultaneously placed therein.
- 241 Dispensing auger:**  
This subclass is indented under subclass 240. Method or apparatus wherein the dispenser includes a helical rib along the length thereof for removing earthen material to form a pile cavity when the dispenser is rotated.
- 242 Driven dispenser with separable tip:**  
This subclass is indented under subclass 240. Method or apparatus wherein the form or delivery means is initially provided at its lower end with means to facilitate penetration in the earth, which means remains in the cavity as the form or delivery means is withdrawn.
- 243 Withdrawing form structure:**  
This subclass is indented under subclass 233. Method or apparatus in which the fluent material is placed in a form, and after the form is substantially filled, the form is withdrawn from the member, said withdrawal occurring before or after the setting or congealing of the member.
- SEE OR SEARCH CLASS:  
166, Wells, subclass 287 for a process of cementing a well including a step of removing the molding or forming means.
- 244 With anchoring of structure:**  
This subclass is indented under subclass 232. Method or apparatus in which either (a) a protrusion or enlargement is provided to inhibit the settling or withdrawal of the member into or from the earth, or (b) the member is made secure to the earth by applying a cementitious material.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
224+, for a method or means for anchoring a marine structure to the seabed.

- 237+, for casting a columnar structure in situ, wherein the same is provided with a subsurface enlargement.
- 259.1+, and the search notes thereunder for subject matter relating to earth anchors.

**SEE OR SEARCH CLASS:**

- 52, Static Structures (e.g., Buildings), subclasses 155+ for piercing or expanding anchors which in use are buried in the earth.

**245 Driving removable wall supporting core:**

This subclass is indented under subclass 232. Method or apparatus in which the elongated member comprises a hollow shell which is driven into the earth by means which is adapted to extend within the interior of said hollow shell to prevent the buckling in or collapsing of the walls thereof.

**SEE OR SEARCH CLASS:**

- 173, Tool Driving or Impacting, subclass 128 for an anvil to transmit impact from a hammer head to a tool or the like.

**246 Diametrically retractable core:**

This subclass is indented under subclass 245. Method or apparatus in which the core is adapted to be readily reduced in diameter to facilitate removal or insertion of the core from or into the hollow shell.

**247 Fluid pressure actuated:**

This subclass is indented under subclass 246. Method or apparatus wherein a liquid or gas under pressure is employed to change the diameter of the core.

**248 With subsurface fluid discharge:**

This subclass is indented under subclass 232. Method or apparatus including a step or means for dispensing a fluid below the earth surface to assist in positioning or forming said columnar member.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 163, for submerged pipe laying apparatus and methods employing fluid jets to entrench the pipe in the bottom.

- 226, for a method or apparatus for sinking a marine structure into the seabed using fluid jets.

**SEE OR SEARCH CLASS:**

- 175, Boring or Penetrating the Earth, subclass 67 for a process of boring by fluid erosion; and subclass 424 and the search noted for earth boring nozzles.

**249 Caisson or hollow shaft:**

This subclass is indented under subclass 232. Method or apparatus wherein the cross section of the elongated member is initially in the shape of an annulus.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 8+, for pressurized pneumatic caissons.
- 133, for subject matter relating to a vertical passageway in the earth.
- 233+, for methods or apparatus for casting a hollow pier or filling a caisson with concrete in situ.
- 256+, for a concrete hollow pier or caisson.

**250 Comprising series of connected longitudinal sections having diverse compositions:**

This subclass is indented under subclass 231. Elongated member comprising two or more distinct sections serially connected in end-to-end fashion, and wherein at least one of said sections is made of a substance different than that of an adjacent section.

**SEE OR SEARCH CLASS:**

- 52, Static Structures (e.g., Buildings), subclasses 721.1+ and 726.1+ for composite shafts (e.g., utility poles).

**251 With joint or connection between sections of similar material:**

This subclass is indented under subclass 231. Elongated member comprising a plurality of longitudinal sections of similar material and including means for connecting the sections end-to-end.

**SEE OR SEARCH CLASS:**

- 52, Static Structures (e.g., Buildings), subclasses 726.1+ for shafts comprised of end-to-end connected sections.

- 403, Joints and Connections, appropriate subclasses for a connecting means, per se.
- 252 Between concrete sections:**  
This subclass is indented under subclass 251. Method or apparatus wherein the connecting means is employed to join one concrete section to another concrete section.
- 252.1 Pile having screw threads:**  
This subclass is indented under subclass 231. Subject matter comprising a pile having helical ribs thereon enabling said pile to be screwed into the ground.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
224+, for pile with screw threads in a marine environment.
- 253 With driving or cutting tip:**  
This subclass is indented under subclass 231. Method or apparatus relating to the provision of means at the lower end of the elongated member to facilitate penetration of the member into the earth when an external force is applied to said member.
- SEE OR SEARCH CLASS:  
175, Boring or Penetrating the Earth, subclasses 19+ for drive points for boring without earth removal; and subclasses 414+ for impact-type bits.
- 254 Longitudinally ribbed:**  
This subclass is indented under subclass 253. Method or apparatus wherein the elongated member or driving tip is provided with a protruding ridge along its length or a portion thereof.
- 255 With end cap:**  
This subclass is indented under subclass 231. Method or apparatus wherein a cover member is positioned at either end of the elongated member either before or after said columnar member is positioned or formed in the earth.
- SEE OR SEARCH CLASS:  
52, Static Structures (e.g., Buildings), subclass 301 for an end cap for a shaft.
- 256 Concrete:**  
This subclass is indented under subclass 231. Elongated member composed of concrete, plain or reinforced.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
275, for concrete sheet piles.
- SEE OR SEARCH CLASS:  
52, Static Structures (e.g., Buildings), subclass 722 for a concrete shaft (e.g., utility pole).
- 257 With form or casing:**  
This subclass is indented under subclass 256. Elongated member which, when installed in the earth, comprises an elongated concrete body substantially enclosed by a distinct outer shell, which may also be concrete.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
233+, for methods and apparatus for forming concrete piles in situ.
- 258.1 EARTH TREATMENT OR CONTROL:**  
This subclass is indented under the class definition. Subject matter concerning the application of a force, substance, or structure to an earth formation to condition the formation or to prevent undesired movement of the earth formation.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
128.1, for the treatment of earth containing an unwanted element, product, or condition.  
129.3, for the treatment of earth prior to the subterranean deposition of waste in the earth.  
130, for the temperature modification of an earthen formation.
- 259.1 Rock or earth bolt or anchor:**  
This subclass is indented under subclass 258.1. Method or apparatus wherein a rodlike tension member penetrates the earth to either tie plural layers together and create compression stress within them, or secure a treating or control structure to the earth, or a method or apparatus for installing a rodlike member which resists

withdrawal from the earth, and which includes a step or means for treating the earth (e.g., grouting).

SEE OR SEARCH THIS CLASS, SUB-CLASS:

232+, for a method or apparatus for installing an elongated foundation member, e.g., pile, post, etc., adapted to support a superstructure thereon.

259.5+, for rock or earth bolt or anchor with grouting feature.

288+, 302.1, 302.2, and 302.3, for method or means to support a subterranean roof.

SEE OR SEARCH CLASS:

52, Static Structures (e.g., Buildings), subclasses 155+ for an expanding or piercing earth anchor, per se; subclasses 127.1+ for manually operated anchor positioning implement; or subclasses 741.11+ for a method of driving or positioning an earth anchor.

173, Tool Driving or Impacting, appropriate subclasses for power-driven apparatus for driving a member, which may be an anchor, into the earth.

411, Expanded, Threaded, Driven, Headed, Tool-Deformed, or Locked-Threaded Fastener, appropriate subclasses for miscellaneous threaded bolts of general utility. See subclass 15 of Class 411 for the line between these classes.

#### **259.2 Frangible bolt:**

This subclass is indented under subclass 259.1. Subject matter comprising a bolt having structure or a property such that it will break at a predetermined torque.

(1) Note. The bolt is used with a grout in many cases.

#### **259.3 Expandable tube:**

This subclass is indented under subclass 259.1. Subject matter comprising a device having means which permits it to expand after it is inserted into a hole in an earthen formation (e.g., a subterranean roof).

#### **259.4 Bolt having wedge expander:**

This subclass is indented under subclass 259.1. Subject matter comprising a split shank for accommodating a wedge to expand the shank

portion as the bolt is driven into a hole in an earthen formation.

#### **259.5 With settable material feature:**

This subclass is indented under subclass 259.1. Method or apparatus wherein a congealable material (e.g., epoxy, resin, etc.) is applied to the earth surrounding the bolt.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

225, for appropriate subject matter relating to a marine environment.

266, for grouting a pole or similar construction to the earth.

#### **259.6 Breaking canister or packet:**

This subclass is indented under subclass 259.5. Method or apparatus wherein the insertion of the bolt into the earth destroys a container thereby releasing the settable material into the hole.

#### **262 With retaining wall:**

Method or apparatus under subclasses 259.1+ wherein the rodlike tension member supports a continuous earth confining barrier of indeterminate length.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

284+, for a retaining wall, per se.

#### **263 Chemical:**

This subclass is indented under subclass 258.1. Method or apparatus wherein a substance which is to be used in or is formed by a chemical process is applied directly to an earth formation to either (a) form a coating on said formation, (b) impregnate the formation, or (c) fill a subterranean cavity within the formation.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

57, for treatment of the walls of an underground fluid storage cavity by a chemical composition.

SEE OR SEARCH CLASS:

166, Wells, subclasses 285+ for methods of cementing, plugging, or consolidating the earth around a well bore, usually under the surface of the ground.

- 404, Road Structure, Process, or Apparatus, subclasses 75+ for processes under that class definition including a step of treating in situ the earth or a roadway.
- 520, Synthetic Resins or Natural Rubbers, appropriate subclasses, particularly Class 523 subclasses 130+ for a composition containing a synthetic resin or natural rubber and having utility in sealing fissures or crevices in stone, rock, or other subterranean formations or in consolidating a formation in a well or in cementing a well or to processes of preparing said composition.
- 264 Organic:**  
This subclass is indented under subclass 263. Method or apparatus wherein the composition of matter contains carbon.
- 265 Bituminous:**  
This subclass is indented under subclass 264. Method or apparatus wherein the organic compound is a derivative of petroleum, coal tar, or similar compound.
- 266 Cementitious (e.g., grouting):**  
This subclass is indented under subclass 263. Method or apparatus wherein the composition of matter is an inorganic hardenable fluent material.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
264, for application of cement that includes an organic composition (e.g., filler).
- SEE OR SEARCH CLASS:  
106, Compositions: Coating or Plastic, subclasses 713+ for portland-type cements, per se.
- 267 Filling subterranean cavity (e.g., underground wall):**  
This subclass is indented under subclass 266. Method or apparatus in which the settable material is introduced into a preformed or existing subterranean cavity to form a barrier or similar construction within the formation, wherein the walls of the cavity define the shape of the finished construction.
- (1) Note. The settable material must directly contact the earth. Hence, the use of a form to construct an underground concrete wall would preclude placement of a patent herein.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
109, for a dam or levee having an impervious core or a method of construction the same.  
229, for a method of strengthening a deteriorated foundation by filling voids therein with cement.  
233+, for methods and apparatus for casting foundation piles in situ.  
275, for concrete sheet piles which are either precast or are cast in situ by using a shaping means (form) other than an earthen cavity.
- 268 Lining:**  
This subclass is indented under subclass 266. Method or apparatus wherein the settable material is applied to an exposed surface of the earth formation to form a layer thereon.
- (1) Note. Subject matter relating to the formation of a lining in a subterranean cavity is included in this subclass.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
133, for subject matter relating to the formation of a shaft, including lining the same with cement.  
150, for a cast in situ tunnel lining. 257, for a cast in situ hollow pier or caisson employed as a foundation.
- SEE OR SEARCH CLASS:  
404, Road Structure, Process, or Apparatus, appropriate subclasses for a method or apparatus for forming or repairing a highway, pathway, or walkway structure.
- 269 Injector:**  
This subclass is indented under subclass 266. Apparatus for forcing the settable material into the earth.

**270 Impermeabilization:**

This subclass is indented under subclass 258.1. Method or apparatus wherein a structure is applied to an earth formation to make the same resistant to the flow of liquids.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 38, for a subsurface moisture barrier placed between two horizontal layers of earth for drainage or irrigation purposes.
- 53+, for a fluid storage cavity in or on the earth provided with a fluid impermeable barrier.
- 267, for a method or apparatus for placing a cementitious material in an excavation to form an impermeable barrier.
- 268, for a method or apparatus for coating an earthen formation with a cementitious material to render said formation impermeable.

**271 Compaction:**

This subclass is indented under subclass 258.1. Method or apparatus concerning the application of a load or cyclic force to cause consolidation of the formation.

SEE OR SEARCH CLASS:

- 173, Tool Driving or Impacting, appropriate subclasses for details of means to drive or deliver a blow to a tool.
- 404, Road Structure, Process, or Apparatus, subclasses 122+ for rotating drum compacting devices, and especially subclass 127 for rotating drum compacting devices specific to slopes or trenches. As between Class 404 and Class 405, rotating drum compacting devices will be placed in Class 404 regardless of the disclosed utility. Class 405 will take those patents which claim rotating drum compacting combined with an additional operation of the Class 405 type. Further, see subclass 133 of Class 404 for tampers used to prepare a road bed.

**272 Shoring, bracing, or cave-in prevention:**

This subclass is indented under subclass 258.1. Method or apparatus concerning prevention of earth movement by means of an external structural support.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 8+, for a pressurized caisson.
- 132+, for a shoring method or apparatus combined with a step or means forming an underground passageway (e.g., tunnel) especially 133, for a caisson or other shoring means which remains in the earth as part of a finished shaft or which includes shaft excavating means.
- 333, for subject matter relating to a caisson which remains with a finished foundation.

**273 Cribbing:**

This subclass is indented under subclass 272. Method or apparatus wherein the structural support is an earth confining barrier comprising a number of superimposed and juxtaposed elements arranged to define voids or interstices adapted to be filled with earth or other loose material to prevent undesired movement of the barrier.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 33, for cribbing employed specifically as a wave or flow dissipator.

**274 Sheet piles:**

This subclass is indented under subclass 272. Method of apparatus wherein the structural support is an earth confining barrier comprising a series of contiguous elongated members which are maintained in a substantially upright position solely by driving or otherwise positioning a substantial portion of the members below the earth surface.

- (1) Note. Since most sheet piles are of general utility (e.g., retaining walls, foundation, cofferdams, caissons, etc.) all patents with claims not specifically limiting in regard to utility have been classified as original in this and indented subclasses. Those patents claiming

method or apparatus restricted to an area other than earth retaining have been placed in the appropriate subclasses above and cross-referenced here.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

231+, for piles employed as foundations and methods and apparatus for installing the same.

**275 Concrete:**

This subclass is indented under subclass 274. Method or apparatus wherein the elongated members are made of concrete, plain or reinforced.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

267, for subject matter relating to the formation of an underground wall, wherein a cementitious material is introduced into and directly contacts the sides of an excavation.

**276 Metal:**

This subclass is indented under subclass 274. Method or apparatus wherein the elongated members are made of metal.

**277 C or I sections:**

This subclass is indented under subclass 276. Method or apparatus wherein the elongated members are individually or collectively of channel or I-shape in cross section.

**278 Head and claw interlock:**

This subclass is indented under subclass 276. Method or apparatus wherein the elongated members have on each edge an enlarged "head" and a protruding "claw", as viewed in cross section, the "head" of each edge adapted to slip between the "head" and "claw" of the edge of the next member of the series.

**279 With separate fastening, reinforcing, or sealing means:**

This subclass is indented under subclass 276. Method or apparatus wherein a separate means is provided which is adapted to be secured to the elongated members to either secure one member or another, prevent a member from deforming or yielding under stress, or make a

juncture between members impervious to some material.

**280 Cellular:**

This subclass is indented under subclass 276. Method or apparatus wherein the elongated members either singly or collectively define an enclosed space or compartment.

**281 Bulb and socket interlock:**

This subclass is indented under subclass 276. Method or apparatus wherein an elongated member is joined to an adjacent one by an enlarged protuberance along an edge of one of the members captively engaged in a corresponding recess along the edge of the other member.

**282 Trench shoring:**

This subclass is indented under subclass 272. Method or apparatus pertaining to a temporary bracing to prevent movement of the earthen walls of a longitudinal, horizontal, open topped excavation of indeterminate length.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

149, for subject matter relating to tunneling by cut and cover method.

**283 Shield type:**

This subclass is indented under subclass 282. Method or apparatus wherein the temporary bracing moves with the work as the excavation continues.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

141+, for a shield employed specifically in the formation of an underground passageway.

**284 Retaining wall:**

This subclass is indented under subclass 272. Method or apparatus wherein the structural support comprises a substantially vertical barrier positioned to prevent earth lying against one side thereof from shifting.

(1) Note. This subclass includes "sea walls" with no wave of flow dissipation feature.

(2) Note. Bridge approaches with abutments comprising a retaining wall type

structure (usually a reinforced wall) are generally classified in this subclass.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 16+, for a revetment, and see the notes to the subclass definition for the distinction between a revetment and a retaining wall.
- 21+, for a retaining or "sea" wall with wave or flow dissipation features.
- 262, for the combination of a retaining wall and means to anchor the same to the earth.
- 273, for a crib-type retaining wall.

**285 Pile and panel:**

This subclass is indented under subclass 284. Method or apparatus wherein the vertical barrier comprises a plurality of spaced elongated columnar members driven or otherwise positioned in the ground and between which are supported wall sections which serve to retain the earth lying against one side thereof.

**286 Concrete:**

This subclass is indented under subclass 284. Method or apparatus wherein the vertical barrier or a portion thereof is composed of concrete, plain or reinforced.

**287 Cast in situ:**

This subclass is indented under subclass 286. Method or apparatus wherein the barrier is formed of concrete in the position in which it is to be used.

**287.1 Cast in situ:**

This subclass is indented under subclass 272. Subject matter wherein the structure for supporting a subterranean formation is made from a settable material which is allowed to congeal on-site.

**288 Roof support:**

This subclass is indented under subclass 272. Method or apparatus wherein a tunnel or mine overhead is braced to prevent cave-in.

SEE OR SEARCH CLASS:

- 248, Supports, subclasses 351+ for props and braces of general utility.

**289 Inflatable:**

This subclass is indented under subclass 288. Method or apparatus wherein the roof support includes a pliant receptacle which is filled with a fluid under pressure.

SEE OR SEARCH CLASS:

- 254, Implements or Apparatus for Applying Pushing or Pulling Force, subclass 93 for inflatable jacks of general utility.

**290 Jack:**

This subclass is indented under subclass 288. Method or apparatus wherein an extensible, vertical prop supports the overhead.

SEE OR SEARCH CLASS:

- 91, Motors: Expansible Chamber Type, appropriate subclasses for hydraulic actuators in general.
- 254, Implements or Apparatus for Applying Pushing or Pulling Force, appropriate subclasses for jacks of general utility.

**291 Mobile:**

This subclass is indented under subclass 290. Method or apparatus wherein the jack is provided with a means which allows it to be moved from place to place.

**292 Position restoring:**

This subclass is indented under subclass 291. Method or apparatus for returning the prop to its initial attitude when it has been relieved of the roof load.

**293 With canopy extension:**

This subclass is indented under subclass 291. Method or apparatus wherein the roof supporting section of the prop includes means associated therewith which can be projected outwardly from an edge of the section into a roof supporting orientation.

**294 Telescoping:**

This subclass is indented under subclass 293. Method or apparatus wherein the extension is projected outwardly in a plane parallel to the roof contacting surface of the section.



**295 Cantilevered:**

This subclass is indented under subclass 291. Method or apparatus wherein a connecting member is pivotally attached at one end to a roof supporting section of the prop and at the other end to the base of the prop and a force is applied to the connecting member to move the roof supporting section to its operative position.

**296 With rubble shield:**

This subclass is indented under subclass 291. Method or apparatus wherein means secured to the prop provide protection from falling debris.

- (1) Note. The protection means provided for in this subclass must not provide support for the roof.

**297 With contour following feature:**

This subclass is indented under subclass 291. Method or apparatus wherein the prop includes means permitting the base or roof supporting section to follow irregularities in the surface of the floor or roof as the prop is advanced.

**298 Under load advanceable:**

This subclass is indented under subclass 291. Method or apparatus wherein the prop is advanced while the roof supporting section remains in its load bearing orientation.

**299 Self-advanceable:**

This subclass is indented under subclass 291. Method or apparatus wherein the prop is self-propelled.

**300 Paired:**

This subclass is indented under subclass 299. Method or apparatus wherein two props are laterally connected so that when one prop is in the roof supporting orientation it serves as an anchor for advancing the other prop.

**301 Nested:**

This subclass is indented under subclass 300. Method or apparatus wherein one prop consists of two laterally spaced rigidly connected sections with the other prop received therebetween.

**302 Control system:**

This subclass is indented under subclass 291. Method or apparatus for supply of motive energy to the prop via a regulating circuit to actuate the prop.

**302.1 Subterranean roof plate:**

This subclass is indented under subclass 288. Subject matter comprising a plate, intended to be used in conjunction with a bolt, for supporting an overhead earthen formation (e.g., tunnel).

SEE OR SEARCH THIS CLASS, SUBCLASS:

259.1+, for rock or earth bolt or anchor.

**302.2 Cable or strap support:**

This subclass is indented under subclass 288. Subject matter comprising a cable or strap which is used to provide support for an overhead earthen formation in a subterranean cavity (e.g., tunnel).

SEE OR SEARCH THIS CLASS, SUBCLASS:

259.1+, for rock or earth bolt or anchor.

**302.3 Mesh support:**

This subclass is indented under subclass 288. Subject matter comprising a web of interlocked or intertwined elements or fabric which is secured to an overhead earthen formation in a subterranean cavity to support the roof.

SEE OR SEARCH THIS CLASS, SUBCLASS:

259.1+, for rock or earth bolt or anchor.

**302.4 Ground stabilization or reinforcement:**

This subclass is indented under subclass 258.1. Subject matter for (1) enhancing or increasing the resistivity of the earth or soil, or (2) supporting the earth or soil, to prevent unwanted movement or deterioration of the earth or soil.

SEE OR SEARCH THIS CLASS, SUBCLASS:

129.2, for ground stabilization or reinforcement involving compaction of the soil or waste prior to or after the subterranean deposition or containment of waste in the soil.

272, for the prevention of the movement of earth by means of an external support structure.

**302.5 Vibration dampener:**

This subclass is indented under subclass 302.4. Subject matter which stabilizes or reinforces the earth to aid in controlling or diminishing the effect of an oscillatory movement of the earth.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

229, for a foundation in contact with the earth which provides a stable base for supporting a superstructure.

SEE OR SEARCH CLASS:

52, Static Structures (e.g., Buildings), subclass 169.1 for a construction there provided for with a terranean feature, subclass 274 for an intersecting construction with a foundation, and subclass 292 for a footing peculiar to the support of a wall or shaft.

**302.6 Erosion protection:**

This subclass is indented under subclass 302.4. Subject matter which stabilizes or reinforces the soil or earth against the wearing or washing away or other deteriorating effects of soil by water or wind.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

15, for the stabilization of a bank, shore, or bed having a junction with a body of water.

**302.7 Net, fabric, or sheet type:**

This subclass is indented under subclass 302.4. Subject matter wherein (1) an open-meshed member, (2) a cloth-type member, or (3) a broad thin member stabilizes or reinforces the soil or earth.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

302.3, for a web of interlocked or intertwined elements or fabric which is secured to an overhead earthen formation in a subterranean cavity to support the roof.

SEE OR SEARCH CLASS:

428, Stock Material or Miscellaneous Articles, subclass 98 for a structurally defined web or sheet.

**303 MISCELLANEOUS:**

This subclass is indented under the class definition. Subject matter not provided for in any of the above subclasses.

END